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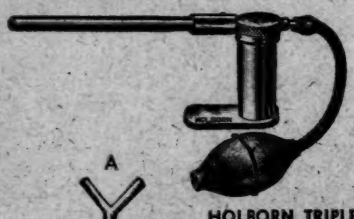

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THE TOXICITY OF 2,2-*bis* (*p*-CHLORPHENYL) 1,1,1-TRICHLORETHANE (D.D.T.)

BY

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AND

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The introduction of the new synthetic insecticide 2,2-*bis* (*p*-chlorphenyl) 1,1,1-trichlorethane (D.D.T.) demands that possible hazards to man be determined and potential dangers safeguarded against. We describe in this paper investigations on the toxicology of D.D.T. which we carried out during the period April, 1943, to March, 1945. These have been the subject of several reports to the Ministries of Production and of Supply, at whose request we have prepared the following account.

Methods

Our material embraces a variety of laboratory animals as well as human volunteers. Toxic effects and fatal doses (L.D.50) were determined in rats, guinea-pigs, and rabbits, D.D.T. being administered by various routes, in single or repeated doses, and dissolved in a number of solvents. Both crude and pure samples of D.D.T. were employed; the former is said to contain 5% sulphuric acid, but appears to behave similarly to pure D.D.T. Some experiments on the action of D.D.T. powder on healing of experimental wounds were also done. Human experiments were chiefly confined to the wearing of garments and underclothes impregnated with D.D.T. In all cases a close watch was kept for the development of toxic effects, and exposed animals were the subject of careful pathological examination at death or when the observational period had elapsed. Various investigations were made on selected subjects, including blood and urine examination and body-weight determination throughout the course of exposure. These will be described in the appropriate sections. Necropsies on animals were performed immediately after death or, frequently, when the animals were moribund. Microscopical examination of all the important organs and tissues, including the central nervous system in representative cases, followed upon preparation of paraffin and frozen sections. Tissues were fixed in 10% formol-saline and 10% formol-alcohol, embedded after passage through the alcohol series, and many sections stained with Ehrlich's acid haematoxylin and eosin and Weigert's iron haematoxylin and van Gieson as a routine procedure, and often with Heidenhain's azan method, v. Kossa's method for calcification, the prussian-blue method for iron, Weigert's elastica method, and Turnbull's Jenner method for bone marrow. The Scharlach-R fat stain was employed with frozen sections after 10% formalin fixation. The central nervous system was dissected out with very great care so as to avoid disturbance of relationships and trauma from handling. After prolonged fixation in 10% formol-saline, transverse wedges of tissue, a few millimetres thick, were removed at the level of the anterior third of the frontal lobes, at the level of the hypophysis, through the middle of the cerebellum and pons, and at the commencement of the medulla. Such wedges included the whole of the cerebral tissues in a cranio-caudal direction. Paraffin sections were stained with the usual haematoxylin and eosin and van Gieson methods, with toluidine blue, and with the Marchi method. Sections from the main levels of the spinal cord were also prepared from a limited number of animals.

ANIMAL EXPERIMENTS

Single Doses.—Single doses of D.D.T. were administered to groups of at least 5 animals by skin application—the skin area being shaved 24 hours previously—by stomach tube, and by subcutaneous and intramuscular injection. For skin application we used solutions of D.D.T. in ether, kerosene, dimethyl phthalate, and dibutyl phthalate. The two latter solvents have their uses in insect control. For gastric and subcutaneous administration we dissolved D.D.T. in medicinal liquid paraffin and a small amount of tragacanth. About 400 animals were used in these experiments. For skin application of single doses the L.D.50 for our rabbits was 300 mg./kg., for guinea-pigs 1,000 mg./kg., and for rats 3,000 mg./kg. Results were in close agreement when ether and kerosene were used as solvents. For subcutaneous injection the L.D.50 for rabbits was 250 mg./kg., for guinea-pigs 900 mg./kg., and for rats 1,500 mg./kg. Liquid paraffin was the solvent. For gastric administration the L.D.50 for rabbits was 300 mg./kg., for guinea-pigs 400 mg./kg., and for rats 800 mg./kg. Control animals given the largest amount of solvents used in the above tests, but without D.D.T., were unaffected. Results of tests in which dimethyl phthalate and dibutyl phthalate were employed as solvents were substantially in agreement with the above, though we did not carry out subcutaneous tests. Although the L.D.50 levels were definite enough in most cases, a certain number of animals died after doses lower than these levels. Generally speaking, the lowest dose which produced some casualties was about half to two-thirds that of the L.D.50. Even so, it is apparent that the toxicity of D.D.T. when given in solution by various routes as single doses is not high.

Repeated Administration of D.D.T.—Repeated skin application of D.D.T. has been carried out with various solutions and emulsions of D.D.T., with the dry powder, alone or mixed with pyrophyllite, and through the agency of impregnated cloth. The effect of repeated gastric administration has also been investigated, and some experiments in which animals were frequently exposed to heavy mists of D.D.T. in chambers were performed. Precautions against licking contaminated skin were always taken.

1. Solutions or Emulsions

(i) 10% Kerosene Solution.—Five rabbits were given daily skin applications of 100 mg./kg. D.D.T. as a 10% solution in kerosene; 5 guinea-pigs and 5 rats received 200 mg./kg. All of the rabbits were dead after 6, the guinea-pigs after 12, and the rats after 14 applications. All showed clinical features of D.D.T. poisoning and severe inflammation of the skin.

(ii) 1% Kerosene Solution.—Five rabbits, 5 guinea-pigs, and 5 rats were given daily applications, each 2 hours in duration, of 50 mg./kg. D.D.T. as a 1% kerosene solution. No rabbit survived more than 16 applications, no guinea-pig more than 18, but only one rat died during a series of 20 applications. Nervous symptoms were uncommon, but fatal cases showed severe liver damage. Skin irritation occurred in all. Similar groups of rabbits, guinea-pigs, and rats received daily applications of 10 mg./kg. D.D.T. Rabbits survived 20 such exposures without clinical signs of intoxication, and no pathological changes were found when they were killed off. Skin irritation, however, was present. Two guinea-pigs died after 11 applications, both showing moderate liver damage. The other three received 14 applications without ill effects. None of the rats were affected by 14 applications. Control experiments with kerosene alone showed that skin irritation developed and sometimes animals died from this. It is obvious that kerosene may have accounted for some of the deaths in the above-experiments. This was more especially the case with rabbits.

(iii) 1% Ethyl Alcohol, Acetone, and Ether Solutions.—Groups of 5 rabbits, 5 guinea-pigs, and 5 rats received daily applications, each lasting 2 hours, of 10 mg./kg. D.D.T. as 1% ethyl alcohol, acetone, or ether solution. With ethyl alcohol as solvent, 2 of 5 rabbits died after 9 and 12 applications respectively; with acetone as solvent, 1 of 5 rabbits and 2 of 5 guinea-pigs died after 7, 7, and 9 applications respectively; with ether as solvent, 1 of 5 rabbits and 2 of 5 guinea-pigs died after 13, 7, and 8 applications respectively. No rats died during the experimental period of 14 applications. All fatal cases showed moderate or severe liver damage but no nervous symptoms.

(iv) Emulsions.—(*a*) Emulsion I (Geigy), composed of 15 parts D.D.T., 30 parts toluene, 15 parts hexamethylenetetramine, 36 parts sulphonated castor oil, and 4 parts ammonia, was diluted 1:100 with water. Five rabbits, 5 guinea-pigs, and 5 rats received 14 daily applications each of 5 c.cm./kg. diluted emulsion (about 7.5 mg./kg. D.D.T.). Two guinea-pigs died from intercurrent infection after 14 applications. No clinical features of D.D.T. intoxication were seen in any of the animals, and the skin at the site of application was not inflamed. At the termination of the experiment all animals were killed and their main organs examined microscopically, but no pathological changes were found.

(*b*) Pymulso concentrate Mark X, containing 1% w./v. D.D.T. and about 0.2% pyrethrins, diluted 1:10 with water, was applied on 12 occasions in daily doses of 5 c.cm./kg. to the skin of 2 rabbits, 4 guinea-pigs, and 6 rats without giving rise to any evidence of skin irritation, intoxication, or pathological change in their organs.

(*c*) Pymulso concentrate Mark XI, containing 2% w./v. D.D.T. and 0.4% pyrethrins, diluted 1:20 with water, was applied in daily doses of 5 c.cm./kg. on 12 occasions to 2 rabbits, 4 guinea-pigs, and 6 rats. No ill effects were observed in the skin or organs when the animals were killed at the end of the experiment.

(*d*) Pymulso special, containing 0.5% w./v. D.D.T. and 0.02% w./v. pyrethrins, was applied on 5 occasions in doses of 5 c.cm./kg. (25 mg./kg. D.D.T.) to the skin of 5 rabbits and 5 rats. Although no symptoms of D.D.T. intoxication developed, the skin became severely irritated. Experiments were discontinued at this stage. Microscopical examination of the main organs disclosed no pathological change attributable to D.D.T.

(*e*) Special pymulso concentrate, containing 10% w./v. D.D.T. and 0.4% w./v. pyrethrins, diluted 1:20 with water, was applied on 15 occasions in doses of 5 c.cm./kg. to the skin of 5 rabbits and 5 rats. Each application, equivalent to 25 mg./kg. D.D.T., lasted 2 hours, after which the emulsion was removed with water. No inflammation of the skin developed, and the animals appeared normal throughout the experimental period. They were killed and their organs examined microscopically, but no pathological changes attributable to D.D.T. were found.

It is apparent from these experiments that the manner of preparing the D.D.T. suspensions is important for toxic effects and that some of the pymulso suspensions are more suitable than others.

2. D.D.T. Powder

Groups of rabbits, 4 animals in each group, were given 16 daily applications of 50 mg./kg. and 10 mg./kg. D.D.T. powder on the shaved skin of the back. Each application lasted two hours. During the experimental period no symptoms developed, there was no loss of weight, and the organs and skin showed no pathological changes when examined microscopically at the end of the experiment. Three rabbits, 3 guinea-pigs, and 3 rats received 9 daily applications, each of 2 hours' duration, of dry 5% D.D.T. in pyrophyllite, in doses of 200 mg./kg. (i.e., 10 mg./kg. D.D.T.) for rabbits and guinea-pigs, and 500 mg./kg. (i.e., 25 mg./kg. D.D.T.) for rats. No skin irritation developed. The animals appeared normal throughout the experimental period, and when killed showed no pathological changes in their organs. Two rabbits, 2 guinea-pigs, and 2 rats received similar treatment, the powder being wetted on application to the skin. No ill effects developed.

3. Impregnated Cloth

Lint was impregnated with 0.5% D.D.T. in benzene and allowed to dry. Portions of this lint containing known amounts of D.D.T. were placed in contact with the shaved skin of rabbits and kept there for 7 days by means of strapping. Five rabbits were so exposed to a dose of 100 mg./kg. D.D.T., five to 50 mg./kg., five to 25 mg./kg., and five to 10 mg./kg. The skin at the site of application of impregnated lint remained healthy. No symptoms of D.D.T. intoxication developed and no pathological changes were found in the organs when the animals were killed at the end of the 7 days.

Repeated Oral Administration of D.D.T.

Ten rabbits and 10 rats were given daily doses of 50 mg./kg. D.D.T. by stomach tube in the form of a 5% suspension in liquid paraffin and tragacanth. Symptoms of D.D.T. intoxication appeared in 8 rabbits, one showing marked tremors after 4 doses (total of 200 mg./kg. D.D.T.), one after 5 doses (total of 250 mg./kg.), two after 9 doses (total of 450 mg./kg.), one after 13 doses (total of 650 mg./kg.), and three after 16 doses (total of 800 mg./kg.). Four animals died after 8, 10, 11, and 20 doses respectively. The remaining 6 rabbits were killed when they had each received 20 doses—i.e., a total of 1 g./kg. D.D.T. Microscopical examination of the organs from all of the rabbits showed slight to moderate liver necrosis in 8, most marked in the 4 animals that died. In all cases necrotic areas presented signs of resolution and liver-cell regeneration without any fibrosis. Slight tubular degeneration occurred in the kidneys of these 8 animals, with calcification in one only. Other organs were unaffected. Rats proved much more resistant, for none of the group of 10 died during a period of 30 doses—i.e., they survived a total dosage of 1.5 g./kg. D.D.T. Moderately severe intoxication appeared in 4 rats after the 28th dose (total of 1.4 g./kg. D.D.T.). All were examined microscopically. No pathological changes were found in any of the organs; the animals showing signs of D.D.T. intoxication presented no abnormality, strange to say.

Repeated Exposure to D.D.T. "Mist"

Thick "mists" of D.D.T. were put up in a cubic-metre chamber by spraying, with an air-driven mechanical sprayer, 15 g. of D.D.T. in about 30 c.cm. of acetone. This gave a nominal concentration of about 1:1000 D.D.T. at the start of the experiment. Four rabbits, 5 guinea-pigs, and 10 rats were exposed to this mist for 2 hours on 11 occasions during 14 days. Two rabbits died after 8 and 9 exposures, one guinea-pig after 9 exposures and four after 10 exposures, one rat after 4 exposures, three after 5, two after 6, one after 8, two after 9, and one after 10. All showed clinical evidence of D.D.T. poisoning. Evidently rats and guinea-pigs are more sensitive than rabbits to this form of intoxication. But such exposures are severe and probably well out of proportion to practical affairs. A further experiment was carried out in which 5 rabbits, 5 guinea-pigs, and 5 rats were exposed under similar conditions for 2 hours daily on 6 separate occasions to a mist produced by spraying 5 g. of D.D.T. in 20 c.cm. of acetone. This corresponded to an initial concentration of about 1:3000 D.D.T. No symptoms of intoxication developed and no pathological changes were found in the organs when the animals were killed at the end of the experiment.

Clinical Features and Pathological Changes in D.D.T. Poisoning

With large single doses of D.D.T. administered by any route the first signs of intoxication appear in 12 to 24 hours. The animal is cold to the touch, its fur is ruffled, and diarrhoea may be present. It seems to be nervous and very sensitive to stimuli. Muscular weakness sets in about this time, starting in the muscles of the back and soon involving the hind limbs. Fine and then coarse tremors develop in these regions, the animal shaking violently for hours on end. Movement becomes restricted, staggering, often spastic. The forelimbs are seldom affected, so that the animal can partly support itself or even drag its immobile hind quarters about. Anorexia leads to a rapid loss of body weight. Death may occur in 24 to 48 hours or be delayed for several days. Respiration fails, but the heart continues to beat until the end and sometimes for a few minutes after breathing ceases. Convulsions are rare. In animals that recover, nervous and muscular signs may develop and last for some days, eventually disappearing without apparent after-effects. No evidence of permanent damage has been seen in such cases.

Pathological examination of acute fatalities reveals little change in the organs. Pulmonary oedema is frequent, and a terminal manifestation. Mild or moderate damage of the liver and kidneys, similar to that found after repeated administration of D.D.T., may be present, but is not constant. Occasional

the heart muscle contains more fat in its fibres than is normally the case, and the adrenals may be haemorrhagic. A careful examination of the central nervous system has failed to convince us of specific disturbances, even in the most severely affected animals. Degeneration (chromatolysis, vacuolation, pyknosis) and sometimes destruction of a few anterior horn cells in the thoracic and lumbar regions of the spinal cord have been noted, but are not pronounced. The axons of the cord appear unaffected and the higher levels of the brain and brain stem show no changes. Prolonged search of many sections stained by special histological methods has proved of no assistance in locating the seat of nervous disturbance.

With repeated administration of D.D.T. there are loss of body weight, anorexia, and sometimes diarrhoea. When doses are small nervous symptoms do not develop, but with moderate doses tremors and weakness may come and go. Hypersensitiveness to sounds and other stimuli may be striking. Some animals apparently recover from these effects only to die at a later stage; others continue to shake until the end. Death in most instances is quiet, and apparently the result of exhaustion. A different pathological picture is seen, the liver being severely damaged. Numerous areas of focal necrosis or large areas of centrolobular necrosis are uniformly distributed throughout the organ (Fig. 1).

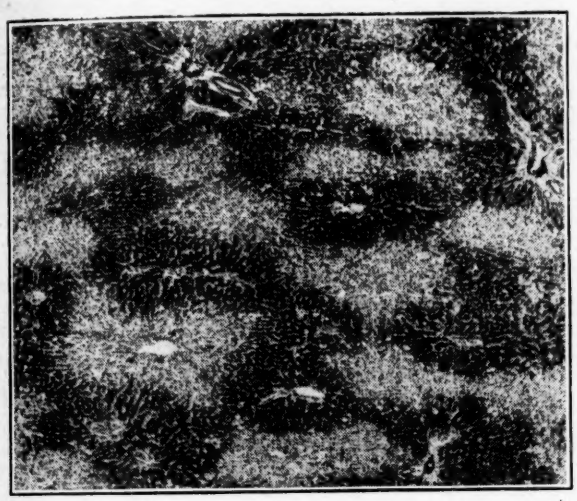

FIG. 1.—Liver of guinea-pig which received daily skin applications of D.D.T.—50 mg./kg. in kerosene—over 9 days. The dark areas are normal liver cells, the pale areas centrolobular necrosis. H. and E. (×30.)

There is much fatty degeneration, with cloudy swelling of liver cells surrounding the necrotic areas. Bile ducts are not affected. Polymorphonuclear leucocytes infiltrate the dead tissue in the early stages; later, mononuclear cells may be numerous. The degree of liver injury is sufficient to account for death. In less severe cases, and especially if D.D.T. be discontinued, necrotic material is removed in the course of a week or two by autolysis and solution as well as by phagocytic activity. Repair is complete, no fibrosis developing even when exposure to D.D.T. is prolonged. Calcification is sometimes seen in some of the necrotic areas. The kidneys, too, are affected, but renal damage is slight compared with that in the liver. Tubule cells show degenerative changes, including fatty deposition and calcification (Fig. 2); sometimes portions of the tubules are necrotic, but glomeruli escape, being congested at the most. The guinea-pig is especially susceptible to calcification. Casts appear in the collecting ducts and Henle loops, but are not numerous. The heart often undergoes mild or moderate fatty degeneration of its muscle fibres, and small focal areas of necrosis have been seen, sometimes infiltrated with polymorphonuclear leucocytes and occasionally undergoing calcification (Fig. 3). Similar necrotic and infiltrated areas have been rarely met with in voluntary muscles. Apart from the more or less rare occurrence of adrenal cortical haemorrhage, the other organs are not affected. A close study of the thyroid gland has failed to convince us of any significant alteration in its structure, but hydropic degeneration and destruction of some of the "water-clear" cells of the parathyroid have been detected during the early stages.

Repeated skin application of D.D.T. in kerosene or in some emulsions may lead to acute inflammation with destruction of the epidermis in places, much oedema of the subcutaneous tissues, and sometimes haemorrhage. Repair follows rapidly when D.D.T. is discontinued. Changes in the blood picture are induced by a large skin application of D.D.T., but are slight with repeated small doses. The haemoglobin percentage tends to decrease, but the red cell count remains unchanged when rabbits are given a large skin exposure. These findings indicate a mild secondary anaemia toxic in origin. Abnormal red cells are not found in the blood. Leucocytosis is also pronounced, starting on the second or third day after exposure usually, neutrophilic cells being mainly concerned. We have noted that animals showing such a response are those which give clinical features of D.D.T. intoxication. In other words, leucocytosis is an intimation that the toxic level is being reached. For that reason it is a useful warning of approaching danger. No characteristic features have been found in the bone marrow of such animals beyond signs of increased white cell production.

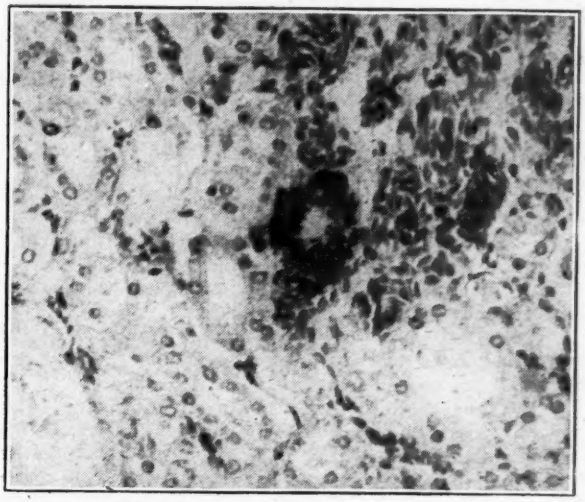

FIG. 2.—Kidney of guinea-pig treated as Fig. 1. The dark annular mass at the centre of the field is a necrotic tubule which has calcified. Near by are necrotic tubules infiltrated with leucocytes and mononuclear cells. v. Kossa and neutral red. (× 350.)

FIG. 3.—Heart muscle of guinea-pig treated as Fig. 1. The dark mass at the centre of the field is a necrotic area of muscle which has calcified. v. Kossa and neutral red. (× 350.)

In rabbits exposed to large skin doses of D.D.T. we have obtained evidence of a rise in blood calcium values. Of seven rabbits investigated for 2 to 12 days after skin application of 200 mg./kg. D.D.T. as a 10% kerosene solution, all showed increase in blood calcium during the first 2 or 3 days, followed by a transient fall below normal levels in most cases. Animals

with nervous disturbances showed the most striking changes in blood calcium, although the calcium increased in some animals which were free from nervous signs. We have also obtained similar, though not so pronounced, results in several rabbits of a group of 5 given repeated small skin applications of D.D.T. The increased blood calcium values did not persist, however.

Effect of a Single D.D.T. Contamination on the Healing of Skin Wounds

It is of interest to know whether D.D.T. contamination might influence the healing of wounds, since this possibility might arise in soldiers wearing garments impregnated with D.D.T. We have employed the method described by Young, Fisher, and Young (1941) for the study of healing of experimental wounds. Thirty unselected male rabbits, average weight 2 kg., were given standard circular skin wounds, 1 cm. diameter, on their shaved backs. Immediately after operation the animals were segregated into three groups of 10. Group 1 served as a control, the standard wounds being untreated apart from applying dry dressings. Group 2 rabbits had their wounds sprinkled with 10 mg. of D.D.T. powder immediately after operation: a sterile spatula was used to distribute the D.D.T., which covered the wound almost completely. Group 3 constituted a further control, 10 mg. kaolin being spread over the wound surface. This experiment was an attempt to control the physical property of a powder which must come into consideration when dry D.D.T. is used; it turned out to be a failure, because the kaolin apparently exerted effects on the healing of the wounds. Sepsis was not seen in any animal, and healing went on uninterruptedly. On the third day after operation tracings of the wound outlines were made on "cellophane," and the surface area was estimated in square millimetres. This was repeated at intervals until healing was complete as judged by epithelization of the wound surface and separation of any scab. The mean daily rate of healing was estimated for the period between the third day and completion of healing. Results are summarized in the table together with the statistical constants.

Table showing Mean Daily Rate of Wound Closure in Rabbits

	Number of Rabbits (n)	Mean Daily Rate of Wound Closure (sq. mm. per day)	Standard Deviation (σ)	Standard Error of Mean $\left(\frac{\sigma}{\sqrt{n}}\right)$
Control group ..	10	7·56	2·30	0·77
D.D.T. group ..	7	8·31	1·74	0·70
Kaolin group ..	9	5·02	0·66	0·23

Three of the rabbits of the D.D.T. group and one of the kaolin group died from a pasteurella infection which is not uncommon in our stock.

It can be shown that there is no significant difference between the mean daily rate of closure of wounds in the control (untreated) group and the D.D.T. group. Wounds given one application of D.D.T. powder immediately after their production heal at the same rate as uncontaminated wounds.

OBSERVATIONS ON HUMAN SUBJECTS

Observations were made on human subjects, (1) wearing undergarments impregnated with D.D.T., or (2) working in contact with D.D.T. The first group comprised 52 soldiers, the second 6 workers who were in daily contact with D.D.T. under laboratory or workshop conditions. These trials were carried out in the late autumn and early winter of 1943.

Trials with Impregnated Undergarments

(i) Twelve soldiers volunteered to wear woollen vests, long woollen drawers, and angola shirts impregnated with 1% D.D.T. (dry weight basis). Each man was examined before the trial began and at frequent intervals thereafter; examination included a careful inquiry into past and family history, the present state of health, and physical examination with full investigation of the blood picture and urine. The two latter were repeated at least once, either completely or in part. The men carried out partial military duties during the period of the trial, and on numerous occasions underwent severe exercise to induce copious sweating. The garments were worn throughout the day and night for 18 to 26 days. No symptoms of absorption of D.D.T. developed and the blood and urine remained unaltered. No loss of weight occurred. Two men showed slight dermatitis of the axillary and calf regions, but in both cases, despite the impregnated clothing being worn continuously, this disappeared within 3 days when treated with calamine cream. It does not seem likely that D.D.T. was responsible for the skin irritation, especially as one subject volunteered the information that he was susceptible to skin rashes associated with new clothing.

(ii) Forty volunteers were divided into two groups of 20 each. Group 1 wore vests, drawers, and shirts impregnated with 1% D.D.T. (dry weight basis) for 26 days without changing these garments. In no case were there features attributable to absorption of D.D.T., and physical examination at the end of the trial proved negative. One man developed a slight skin rash on the 10th and 23rd days shortly after taking a bath, but it faded rapidly and could scarcely be connected with D.D.T. Another man showed small spots on his arms on the 18th day, but these disappeared in a day or two. A third had slight acne, which was not made worse by wearing the impregnated garments. It was not possible to examine the blood or urine in this group. Group 2 had weekly changes of underclothes (prepared as in the previous groups), so that each man wore four separate lots of freshly impregnated garments, each set for a week at a time. Some of these men did not wear drawers. One man developed a small papular rash on his forearms on the 18th day, but this disappeared by the 21st day. Another man had some acne for a short period. A third showed slight dermatitis of the wrists, but this likewise cleared up rapidly after application of calamine cream. No subject experienced any ill effects suggestive of D.D.T. absorption. On the last day of the trial all seemed perfectly fit. The blood and urine were not investigated.

Contact with D.D.T. in the Laboratory and Workshop

Six male workers in the Chemistry Section, Porton, were kept under observation during a period of 77 days, in which they were more or less actively engaged in work concerned with D.D.T. The work was classified as (1) laboratory scale, (2) bulk impregnation scale. The latter included such duties as making up large volumes of D.D.T. solution, impregnation of clothing, distillation of residues. Protective clothing, gloves, and gum-boots were worn. Contact through spilling occurred at times. There was also exposure to carbon tetrachloride. Two men had fairly severe exposure in the course of bulk impregnation of garments over 14 and 15 days. One, though having no abnormal symptoms and appearing fit, showed a rise in blood calcium from 11.2 mg. per 100 c.cm. before contact to 18 mg. per 100 c.cm. on the 15th day, falling to 13.4 mg. two days after he left off working with D.D.T. The other man remained perfectly well during his exposure period. The four cases with less severe exposures presented no abnormal features. In no instance was there evidence of skin irritation.

These human trials on 52 soldiers wearing undergarments impregnated with D.D.T., and the laboratory and workshop observations, suggest there is little risk of local skin irritation and general systemic effects attributable to D.D.T., even with prolonged exposure. In many of these experiments there were ideal conditions for absorption from hot sweaty skin.

Discussion

Our investigation shows that acute exposure to D.D.T., applied to the skin, injected subcutaneously, or administered by stomach tube, is tolerated in large amounts by a variety of animals. Repeated administration of much smaller doses is also possible, though there is some evidence that cumulative effects may occur. It is nevertheless true that D.D.T. can exert toxic effects. These are characterized by striking nervous signs, especially muscular weakness, incoordination, and widespread fine and coarse tremors, when the lethal level is approached; and severe damage to the liver, which presents evidence of cell necrosis and functional impairment, when much smaller amounts of D.D.T. are repeatedly absorbed into the system. For that reason it is essential to have some idea of toxic levels of the agent, and the factors which may promote its entry into the body. Although it is not known what is the fatal dose of D.D.T. for men, it can be assumed that this lies somewhere within the range of lethality for experimental animals, hence the importance of collecting such toxicological data. Already there exists much information on this subject, which we summarize below, and to which our own experiments contribute. The ultimate decision whether D.D.T. may be safely employed as an insecticide must depend on how and in what amounts it is used, the precautions taken against accidents, and the elimination of conditions which may assist in the absorption of the compound. Each of these factors is corollary to the other, and no one can be neglected.

Careful studies of D.D.T. have been made by several groups of American workers, with whose results we are substantially in

agreement. Woodard, Nelson, and Calvery (1944), using mice, rats, guinea-pigs, rabbits, and chickens, conclude that for oral administration of D.D.T. dissolved in corn oil the L.D.50s are as follows: mouse, 448 mg./kg.; rat, 180 mg./kg.; guinea-pig, > 562 mg./kg.; rabbit, > 400 mg./kg.; chicken, > 300 mg./kg. They stress the fact that its action may be irregular, owing perhaps to irregularities in absorption. Toxic doses were higher for intramuscular, intraperitoneal, and subcutaneous injection. The solvent, too, is important, for toxic doses were higher when D.D.T. was suspended in gum acacia. Toxic effects were more readily obtained with solutions than with suspensions. Diets containing D.D.T. were fed to rats, mice, guinea-pigs, and chickens for 3 days to 20 weeks. Ill effects appeared in rats and mice when the food contained D.D.T. to the extent of 500 parts per million, in guinea-pigs with 1,000 p.p.m., and in growing chicks with less than 500 p.p.m. A wide variation in individual susceptibility was noted. Clinical features and pathological changes were similar to those we have described above.

Draize, Nelson, and Calvery (1944) also studied the effect of the application of D.D.T. to the skin. Powders containing 5% D.D.T. produced no evidence of systemic disturbance or irritation of the skin in rabbits, even when a total amount of 4 g./kg. was applied. In similar acute experiments a 10% solution of D.D.T. in corn oil was applied at dosage levels of 390, 600, and 940 mg. of D.D.T./kg. Apart from slight skin erythema, which persisted about 2 days, no ill effects were experienced. In further experiments rabbit skin-doses amounted to 1.17, 1.8, and 2.82 g. of D.D.T./kg. in dimethyl phthalate and to 0.975, 1.5, and 2.35 g. D.D.T./kg. in dibutyl phthalate. No deaths occurred at any of these dosage levels, although all animals showed symptoms of intoxication, which were very severe at the highest levels. The material, it is true, was poorly absorbed, for approximately 25% of the largest doses could be accounted for on the skin dressings. Subacute experiments were also carried out; 0.5 c.cm. of a 5% suspension of D.D.T. in diethylene glycol monoethyl ether was applied daily for 3 weeks to a 2.5 sq. cm. area of the back of each of 6 albino rabbits. A mild erythema developed during the second week of application, but apparently no toxic symptoms. Ninety-day experiments on rats, guinea-pigs, rabbits, and dogs were performed, using a 30% solution of D.D.T. in dimethyl phthalate. The rabbits, rats, and guinea-pigs were inuncted at dosage levels of 150, 300, 600, and 1,200 mg./kg., the dogs at levels of 300, 600, and 1,200 mg. D.D.T./kg. None of the dogs showed any symptoms of toxicity. Careful microscopical examination of their organs disclosed little change apart from slight to moderate degenerative changes in the livers and some monocellular infiltration of the gall-bladder. We find it difficult to attach much importance to these histological findings. Rabbits, rats, and guinea-pigs appeared equally susceptible to such inunctions. Wide individual variations were encountered. The authors state that inunction of doses as low as 0.5 ml. of a 30% solution of D.D.T. per kg. per day (150 mg. per kg. per day of D.D.T.) may cause death in some cases after 30 days. Some animals survived 6 to 8 doses of 600 and 1,200 mg. D.D.T./kg. We would point out that when these doses are expressed in total amounts of D.D.T. administered the amounts tolerated are impressive, even in the experiment in which 150 mg./kg. was applied for 30 days. Obviously the solvent is highly important in such tests, for in our own tests, with different solvents, we observed deaths after the application of much smaller total amounts of D.D.T. It is a matter of great importance, therefore, to make sure that the solvent does not encourage absorption of the insecticide.

Draize *et al.* report that patch tests in human beings and the daily contact of hands of operators with 30% solution of D.D.T. in dimethyl phthalate produced no evidence of irritation. They also describe moderate leucocytosis in animals and successful attempts to sensitize guinea-pigs to D.D.T. The pathological investigations connected with these experiments are separately described by Nelson *et al.* (1944). The main macroscopic features were scaliness or hyperkeratosis of the skin, a pale liver or one showing darkened centrolobular areas, occasionally slight pitting of the kidneys, pulmonary infection in a few animals, chiefly guinea-pigs, occasionally focal haemorrhages in the gastric mucosa, jaundice in one dog, and slight or moderate atrophy of muscles and viscera due to lessened food intake. The surface of two rabbits' gall-bladders was mottled, with oedema of the wall in one. Microscopical findings fell into two groups: (1) those found regularly, and (2) inconsistent changes. Among the former are included moderately severe liver damage in all species except chicks ("little or no liver damage"); focal necrosis of small segments of voluntary muscle, especially with higher doses; hyperkeratosis of skin; and, in rabbits, slight focal epidermic necrosis. Colloid depletion and epithelial desquamation in the thyroid seemed to be common in dogs, rabbits, and guinea-pigs, but not in mice (only two examined). Inconsistent changes include an increased incidence of "spontaneous" encephalitis and focal nephritis of rabbits, gastric mucosal haemorrhages and necrosis, myocardial necroses, haemolytic pigmentation in the gastro-intestinal tract, bone-marrow hyperplasia, and inanition testicular atrophy. The central nervous system was thoroughly searched for lesions, but with negative results. Some information about the response of large animals to D.D.T. are included in this paper. Three cows, three sheep, and one horse received 100 to 200 mg./kg./day of D.D.T. for 3 weeks (one week for one cow and one sheep), either mixed with the food or in capsules when the appetite fell off, as usually happened. Two of the cows developed slow tremors or shaking, especially in the hind legs and neck; none of the other animals of this group developed tremors. None died. Slight fatty degeneration of the liver was found in one cow, and very slight focal necrosis of this organ in another cow. One sheep had slight central necrosis of the liver. Other lesions included atrophy of the spleen, probably inanitional, terminal subendocardial haemorrhages, and very slight focal necrosis of voluntary muscles. No other lesions attributable to D.D.T. were found. It will be seen that the significant changes described by these authors closely agree with those we have observed, with the exception of thyroid alteration, which did not impress us.

In a study of the pharmacological action of D.D.T., Smith and Stohlman (1944) give data for toxicity to animals. They assess the L.D.50 for rats and rabbits given D.D.T. in 1 to 5% solution in olive oil by stomach as 150 and 300 mg./kg. respectively. Two cats receiving 100 and 200 mg./kg. survived. Another cat died after 200 mg./kg. Of eight cats receiving 300 mg./kg. 62% died.

Symptoms were typical and similar to those described by other observers. Cats showed persistent extensor opisthotonos with fine and coarse muscular twitchings, especially of the muscles of the head and neck, lasting for several days, after single oral doses of 300 mg./kg. Rats fed 1,000 parts per million in a semisynthetic adequate diet containing 18% casein died in from 18 to 80 days, but survived 3 months' feeding with 500 p.p.m. D.D.T., though showing tremors and hyperexcitability. In rabbits daily oral administration of 50 mg./kg. D.D.T. in olive oil resulted in death in from 15 to 23 days after a total dose of 0.75 to 1.25 g. per kg. had been given. Parenchymatous liver degeneration with centrolobular necrosis was the most pronounced finding in these. Mild anaemia developed, but white cell counts were not abnormal. Two cats receiving 50 mg./kg. every day or every second or third day developed the characteristic features of poisoning and died—one within 12 days after a total dose of 500 mg./kg., the other within 15 days after a total dose of 300 mg./kg. A third cat, which received 4 doses of 90 mg./kg. within 10 days, died with typical tremors, ataxia, spasticity, paralysis, and terminal extensor rigidity. Skin absorption occurred when 5% solution of D.D.T. in dimethyl phthalate was applied daily over 12 to 14 days in amounts equivalent to 100 mg./kg. D.D.T. The addition of 10% cyclohexanone to such solution did not increase toxicity. Smith describes a useful method for the estimation of D.D.T. in the tissues, body fluids, and excreta, and gives valuable figures for the organ contents. D.D.T. was found in the urine, blood, liver, kidneys, and central nervous system in experimental poisoning.

Lillie and Smith (1944) report on the pathological findings in the animals studied by Smith and Stohlman. The spinal cord of one cat displayed partial tigrolysis of anterior horn cells with pericellular vacuolation; in another cat Nissl bodies were absent from these cells and pericellular and paranuclear vacuolation present. The liver of cats showed fine fatty degeneration, increasing with longer periods of ingestion of D.D.T. A single focus of coagulation necrosis was found in the liver of one cat. The spleen and kidneys showed no definite changes. Focal

haemorrhages occurred in the lungs of one cat, congestion and serous exudation in another. Rats receiving daily doses by stomach equivalent to two-thirds of the lethal dose showed some myelosis and haemosiderosis of the spleen, cloudy swelling, fine fatty degeneration and hyaline casts in some kidneys, hydropic central fatty degeneration, congestion, atrophy, and isolated necrotic cells with some fibroblastic proliferation in the liver. Partly organizing foci of coagulation necrosis were found in this organ in two animals. The brain of rats, killed 3½ to 5½ hours after large doses orally, presented vacuolation of some nerve cells, tigrolysis, and basophilic reticulation of cytoplasm of cells in tegmentum pontis only. Feeding D.D.T. produced fatty and hyaline change in the liver and inconstant fatty change in the proximal convoluted tubules of the kidneys. Rabbits killed in less than five days showed moderate to finely marked centrolobular fat in the liver, splenic haemosiderosis, and occasionally fatty change in the kidneys. Liver lesions were more severe, including centrolobular degeneration and necrosis, in rabbits repeatedly fed on olive-oil suspensions of D.D.T. (50 mg./kg./day total amounts, 0.9 to 1.3 g./kg./day D.D.T.). The brain and spinal cord showed vacuolation around large neurones. The remaining organs were not affected or showed very slight inconstant changes.

Hazards from the use of aerosols, mists, and dusting powders containing D.D.T. have been investigated by Neal *et al.* (1944). Dogs, rats, and guinea-pigs exposed to initial concentrations of 54.4, 12.44, and 6.22 mg./litre D.D.T. in air for 45 minutes under static conditions apparently develop no toxic signs or symptoms. Mice tolerate 6.22 mg./litre if the aerosol contains only 6% sesame oil, but if the concentration of the latter be increased to 9.5% toxic features are seen. Higher concentrations than 6.22 mg./litre cause symptoms and death in a few hours, with pathological changes in liver, kidney, spleen, and spinal cord. The chronic toxicity of aerosols was also carefully investigated. Two puppies were exposed for 45 minutes to a concentration of 12.2 mg. D.D.T./litre, using 1% D.D.T., 6% sesame oil, and 93% freon, on 2 successive days in one week and on 4 successive days in the following week. They showed no signs of intoxication and gained weight. Their organs were unaffected. Ten mice, covered with gauze to prevent fur contamination and exposed in the same way, showed no toxic symptoms, but one died from an unknown cause 3 days after the last exposure. Ten unprotected mice died with typical symptoms of D.D.T. poisoning. Ten mice protected against ingestion showed slightly delayed and somewhat less severe symptoms than unprotected animals, the majority dying 5 days after exposure. Pathological changes in mice included enlargement and fatty change of liver cells with variable congestion, fatty change in proximal and distal convoluted tubules with occasional hyaline casts and congested glomeruli, haemosiderosis of spleen, chromatolysis, occasionally vacuolation, and karyolysis of many of the anterior motor neurones at various levels of the spinal cord. Daily exposure of 2 monkeys and 10 mice for 45 minutes, 5 days a week, over 5 weeks, to intermittent concentrations of 0.183 mg. D.D.T./litre in air—prepared by dispersion every 15 minutes of 1.5 g. aerosol containing 5% D.D.T., 10% cyclohexanone, and 85% freon—caused no toxic effects. If repeated 3 times daily for 4 weeks mice were affected, but monkeys showed no signs of intoxication. The organs of the monkeys were normal; the mice presented rather indefinite liver changes, some nuclei showing various stages of karyolysis. Two human subjects were kept for 1 hour daily on 6 consecutive days in a sealed chamber, 14,750 litres capacity, in which was dispersed every 15 minutes 10.40 g. aerosol containing 5% D.D.T., 10% cyclohexanone, and 85% freon. Neither showed symptoms. Exposure to 10.40 g. of a similar aerosol dispersed every 5 minutes for one hour daily on 5 consecutive days was likewise without ill effects apart from some irritation of the eyes and upper respiratory tract. Higher concentrations of D.D.T. in air cannot be built up by repeated dispersion of an aerosol, as the D.D.T. settles out so rapidly and sticks firmly to any surface. In other words, the maximal aerosol concentration is tolerated by man. Daily exposure for 3 hours, over 4 weeks, to concentrations of 12.48 mg./cubic metre of pure D.D.T. in air, using 10% D.D.T. pyrax dust, produced no toxic effects in dogs. One dog presented microscopical evidence of healing acute liver necrosis. Mice exposed in the same way to 13.9 mg./cubic metre pure D.D.T. experienced intoxication, possibly due to licking dust from their fur. Daily insufflation of 100 mg./kg. pure D.D.T. 6 days a week for 7 weeks caused toxic symptoms and damage of liver, kidneys, and nervous system in one of 3 dogs after 18 days. A fourth dog receiving 100 mg./kg. for 2 weeks and thereafter 200 mg./kg. in 8 fractions for 5 weeks did not show any definite symptoms, though it lost weight and vomited once. Daily oral administration over 7 weeks of 100 mg./kg. pure D.D.T. in 4 fractional doses caused no toxic manifestations in dogs. Rabbits exposed for 48 minutes daily over 4 weeks to a heavy mist of 1% D.D.T. deobase mixture showed some irritation of the mucous membranes of the eyes, upper respiratory tract, and skin, but no evidence of poisoning.

Neal *et al.* conclude that the use of D.D.T. in 1 to 5% solution in 10% cyclohexanone with 90 or 85% freon as aerosols should offer no serious health hazards when used under conditions required for insecticidal purposes. Powders of D.D.T. containing concentrations up to 10% also present no serious risks owing to the relative insolubility of D.D.T. and the large particulate size of the dust. Sprays of 1% D.D.T. deobase mixture should be safe. Ingestion of massive doses of D.D.T., however, is dangerous.

Conclusion

It is apparent from this summary of American investigations and the results of our own experiments that animal tests, though indicating the toxic features of D.D.T., make it clear there is a wide margin of safety in its use as an insecticide. We have always maintained that, provided a maximum concentration of 0.5% D.D.T. be insisted upon for sprays, there is no reason to anticipate any danger to man. Only gross carelessness would be likely to lead to serious features. Even with long-continued exposure to such sprays it is difficult to see how ill effects would be incurred. On the other hand, we are convinced that men handling higher concentrations should take precautions against skin contamination. Cleanliness is essential, the use of gloves and protective garments advisable. In spraying concentrates the use of respirators is advocated. We are in agreement with other workers that dry powders of D.D.T. present no danger of absorption from the skin. It is only when oily solvents are employed that such risks are likely to arise; and here again there is much variation according to the type of solvent used. Moreover, it is our experience that ample warning of the approach to toxic levels is given in the form of anorexia, muscular weakness, and fine tremors. If at this stage D.D.T. is discontinued complete recovery is the rule in animals. Even when liver damage has developed, a fatal issue is not necessarily inevitable, for the organ may still retain its capacity to regenerate if further D.D.T. absorption be prevented. Difficulty arises when liver degeneration sets in without premonitory symptoms or associated nervous signs and a fatal degree of hepatic insufficiency may be reached without warning. We have learned to attach importance to rapid decrease in body weight in such instances. Other features of value in assessing toxic absorption are the development of anaemia and leucocytosis. A rise in blood calcium may also be suggestive, though it is too inconstant to be of any great diagnostic value.

Animal investigations of a new compound have their value and must of necessity be the first approach in the assessment of toxicity risks, but they can never completely replace observation on man. Such limited data as we have been able to collect together with the few American tests on human subjects, indicate that under practical conditions there is little reason to expect danger to health. Increasing experience of the handling of D.D.T. in factories, in the field, and in Army services seems to bear out these conclusions. Nevertheless, it must be emphasized that there are risks when carelessness leads to the contamination of body surfaces with concentrated oily solutions of D.D.T.

Summary

An experimental investigation of the toxicology of D.D.T. on a variety of animals is described, together with observations on human subjects exposed for some time to this compound.

D.D.T. is tolerated in fairly large amounts when administered as single or repeated doses. Toxic levels are not easily reached when dilute solutions suitable for insecticidal purposes are employed. Danger to health is likely to arise only from careless use of concentrates.

Prolonged contact with undergarments impregnated with D.D.T. has not produced any local or general disturbance in human subjects. D.D.T. poisoning is characterized by nervous symptoms and the development of severe damage to the liver. Premonitory symptoms and changes in the blood picture give warning of the onset of the toxic stage.

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ACUTE POISONING DUE TO PETROL VAPOUR

BY

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On July 3, 1942, it became necessary, for security reasons, to place a charge of explosive in the vicinity of a large storage-tank used for aviation spirit. A boring had been made alongside the tank a month previously, the last 12 feet being completed on the day of the accident. Into it a workman descended, and as petrol had been leaking from the tank into the boring he wore an oxygen-breathing apparatus. This had been carefully tested beforehand and found to fit accurately. About 10 minutes after he had descended those above saw that he was behaving oddly. He was standing at the bottom of the boring, holding on to a cross-bar and reeling drunkenly. His mate, who was near by, was immediately informed, and, though unprotected from the fumes, he promptly climbed down in the pit to render assistance. Arrived at the bottom, he could see that petrol was floating on some water there, and the air was filled with the fumes, so that his eyes smarted. He called for a rope and started to heave his mate, who was heavier than himself, laboriously from one horizontal strut to another up the vertical sides. After the first minute or two he could scarcely breathe owing to a sense of constriction in his chest, and he felt sick and began to retch. Nevertheless he persisted doggedly and had heaved his mate on to the top strut, within reach of the helpers above, when he was overcome by dizziness and fell to the bottom again. The shock of the fall brought him to his senses, and he once more began to climb. He had again reached the top strut, when he completely lost consciousness. This time, fortunately, he was seized from above and pulled to safety.

Case I

When the first workman had been lifted out it was found that he had ceased to breathe, and artificial respiration had to be employed for half an hour before normal breathing could be restored. The patient then became restless and violent and had to be given half a grain of omnopon to keep him quiet during transit to hospital. On admission there, soon after, he was still semiconscious, but resisted attempts at examination. He was cyanosed and his respirations were slow and shallow. The pulse was strong—75 a minute—and there was no fever. He was given continuous oxygen with a B.L.B. mask, and in a few hours had regained consciousness. Next day he complained of discomfort in the right iliac fossa, and examination revealed tenderness in this region. He was now perfectly rational and showed no cyanosis. Examination of the cardiovascular and respiratory systems revealed no abnormal physical signs. The urine contained no albumin or sugar, nor were abnormal amounts of lead detected in urine or faeces. A blood film showed no punctate basophilia.

By the fourth day he felt well, apart from slight residual discomfort and tenderness in the right iliac fossa, which persisted till the 12th day. He was discharged from hospital on the 14th day and remained well subsequently. There had been no sequelae when he was heard of two years later.

Case II

The second workman had also stopped breathing when carried to a place of safety. Spontaneous breathing, however, returned after artificial respiration had been applied for five minutes, and he regained consciousness shortly after. He then complained of a choking sensation and a feeling as of a ball in his chest, and felt that he could not take a deep breath. In the ambulance on the way to hospital he had several attacks of abdominal pain. These had become very severe when he reached hospital and were recurring frequently, being associated with much restlessness and excitement. A third of a grain of morphine failed to give relief, so that evipan was injected slowly into a vein till a quiet sleep was procured. In a few minutes, however, he was again restless, and became so violent that it required four people to hold him down. Further evipan had to be given, and this produced an adequate depth of sleep. Next day the pain had returned, but was less severe, and was readily controlled by morphine. There was also retention of urine, requiring catheterization, and headache was still severe.

On examination he was perfectly rational. His pupils were small but equal and reacted to light. The knee- and ankle-jerks were equal and active, and the plantar responses flexor. There was marked abdominal tenderness and guarding, especially in the epigastric region. Examination of the alimentary system proved otherwise negative, and no abnormal signs were found in the cardiovascular or respiratory system. On flexion of the cervical spine there was complaint of pain in the chest. The temperature, pulse, and respiration rates were unaffected. There was no albumin or sugar in the urine, and no abnormal amounts of lead were detected in urine or faeces. A blood film showed no punctate basophilia. The cerebrospinal fluid was clear and colourless, had a pressure of 150 mm., with protein 36 mg. per 100 c.cm., and no increase of globulin or cells.

Attacks of abdominal pain requiring morphine for relief continued till the fourth day, headache being troublesome up to the third day. A urinary infection then supervened, but this responded rapidly to sulphanilamide. The patient was discharged from hospital on the 18th day, having made a complete recovery. A cough developed soon after discharge and persisted for a year. When seen two years later he was in excellent health.

Factors in Toxicity of Petrol

Originally motor spirit was derived entirely from petroleum by simple distillation. From the crude petroleum the portion distilling up to 150° C., and known as raw benzine or naphtha, was first separated, and from this, by re-distillation, petrol boiling at 50–140° C. and pure benzine boiling at 120–150° C. were obtained. Petrol so produced is known as straight-run petrol, and consists largely of pentane, hexane, and heptane. Petrol is also obtained by "cracking" or splitting up the higher paraffins in the petroleum; it then contains olefines as well. The hydrocarbons in these two types of petrol are subject, when used as a motor spirit, to "knocking," or detonative explosion with air. Petrol containing a high proportion of octane is less prone to this fault. As neither crude nor cracked petroleum yields petrols containing an appreciable amount of octane, this is made by the re-forming of either "cracker" gases or straight-run petrol into branched-chain hydrocarbons such as iso-octane (2 : 2 : 4-trimethylpentane) by processes of catalytic combination. Such processes are used particularly in the production of aero spirit. Unfortunately the toxicity of the aliphatic hydrocarbons increases in proportion to the specific gravity and boiling-point (Tschernikow *et al.*, 1935). N-octane, for example, is seven times as toxic as pentane. It is possible that the iso-octane in aero spirit may not be quite so toxic as n-octane—as dimethyl hexane, for instance, is only three times as toxic as pentane. Petrol produced by "cracking" petroleum has a toxicity similar to that of straight-run petrol (Lazarew, 1929).

Aero spirit was the toxic agent in the cases here described. It has a 10% evaporation point of 75° C., whereas in ordinary winter motor spirit the 10% evaporation point is 52° C. The final boiling-point is 180° C., as compared with 140° C. for motor spirit. Like the latter, it may contain a small percentage of benzene and other aromatic hydrocarbons, and these are of still greater toxicity. Benzene, or benzol, which is normally obtained from coal-tar distillation but is also present in certain petroleums, particularly those from Borneo, Rumania, and Galicia, should not be confused with benzine, which comes solely from petroleum, as already described. As benzine and

motor spirit differ but little in composition, the clinical picture in such intoxications is also alike, and the group will therefore be considered as a whole.

Lead tetra-ethyl is not a hazard except to those who produce or blend it or to cleaners of storage-tanks in which evaporation and concentration may have occurred. The amount normally present in petrol is too small to be toxic.

The concentration of petrol vapour required to produce toxic symptoms in man was investigated by Fieldner, Katz, and Kenney (1921) after the death of a rescue worker who entered a petrol tank wearing a half-hour type of oxygen-breathing apparatus. They found that 1 part per 1,000 produced drowsiness at the end of 15 minutes, and vertigo, ataxia, and nausea after one hour, and 7 parts per 1,000 definite intoxication in 5 minutes. In dogs Haggard (1921) found that 10 parts per 1,000 caused convulsions or spasm, 20 parts unconsciousness, and 25 parts death. The effect was similar to that of ether, but the stage of excitement was replaced by convulsions, and the stage of surgical anaesthesia was very brief. Susceptibility is an important factor in toxicity, tolerance resulting from repeated exposure (Machle, 1941).

Circumstances in which Poisoning Occurs

Severe cases of poisoning by inhalation have occurred for the most part in workmen entering benzine tanks or stills to clean or scale them (Foulerton, 1886; Jansen, 1937; Rambousek, 1913), or while emptying such containers (Stiefler, 1928; Petrie, 1908). Coste and Wolz (1935) have recorded two fatal cases due to overflow of petrol filters in a confined space, and Wichern (1909) a case of severe poisoning due to benzine left overnight in the conduit leading from a benzine storage-tank. The victim may become unconscious so rapidly that he is unable to save himself or call for assistance, and may be found dead some hours later. Similarly in excavations or in the pit of a garage (Petrie, 1908; Plummer, 1913), a small amount of petrol may result in dangerous concentrations of vapour, as, being heavier than air, it collects at the bottom.

Mild intoxication is frequent in rubber factories, where it is known as "naphtha jag." While cleaning the rubber churns, for example, workmen may be overcome by the fumes, and in the dipping-room, where they work over large tanks of rubber dissolved in naphtha, severe poisoning may result, as the temperature of the room is kept above 90° F. to aid evaporation. A fatal concentration of the vapour may be found in the drying cupboard in which rubber-leather fabric is hung during its manufacture (Floret, 1927). Kulkow (1926) described mass poisoning when the ventilation system broke down for three-quarters of an hour in a factory making galoshes. In all some 90 persons were affected, 30 requiring transfer to hospital.

The use of petrol in any enclosed space such as a garage may give rise to toxic concentrations. Potts (1915) has described how a man filling automobile tanks fell over unconscious, remaining so for several hours. Permanent damage to the central nervous system, with ocular palsies and pyramidal and cerebellar signs, resulted. Painters working with quick-drying paints in interior decoration may complain of mild symptoms. Lives have been lost from benzine fumes in a carpet-cleaning establishment (Hamilton, 1925).

Leakage or spilling of petrol has been a frequent cause of severe poisoning, as from a bottle of petrol broken in a druggist's cellar (Siemon, 1896), or while cleaning the engine-room of a ship (Johnstone, 1941). Even drawing off benzine into cans in an ill-ventilated room such as a back shop or cellar may result in unconsciousness and death (Floret, 1927). In the home the use of petrol or benzine for cleaning clothes has at times had serious consequences, as when the clothes are soaked in a basin indoors. Petrol has also been used to clean the scalp by pouring it over the hair (Houghton, 1908). This incidentally causes, in addition to general symptoms of intoxication, severe pain and oedema of the scalp. The use in a bedroom of a floor polish containing petrol may result in severe poisoning if ventilation is poor (Roth, 1933).

It is rare for petrol fumes from an internal combustion engine to cause poisoning. Carbon monoxide is a much greater danger. Johnson (1913), however, has described how a number of workmen were affected on several successive days when a petrol engine was used in a tunnel. Carbon monoxide was excluded in this instance. Poisoning from petrol fumes while driving a motor-car is extremely uncommon. Only when the vehicle is manœuvred in a small closed garage while running on a very rich mixture is intoxication likely (Box, 1908).

In wartime petrol may have to be dispatched over-seas in cans stacked in the hold of a ship. If too great a load is put on these the cans in the lower layers may collapse and petrol escape into the hold, thus exposing dock-workers to a high concentration of the vapour. Rudd (1944) has described how in such circumstances men have become unconscious two or three times in one day. Another wartime aspect mentioned by the same author is poisoning due to petrol floating on the sea after the sinking of a tanker. Sailors in lifeboats, intoxicated by the fumes, sprawled over the gunwale and were drowned while sitting in their seats.

Symptomatology

Mild poisoning from petrol or benzine fumes is common in industry, producing symptoms like those of alcoholic intoxication. There is excitement, or euphoria with a tendency to hilarity and, particularly in women, fits of uncontrollable hysterical laughter or crying. Men often become irritable and prone to quarrel. Those who have gained tolerance through repeated exposure may fail to show such emotional changes, and suffer simply from slight tremor of the hands, which makes fine work difficult (Hamilton, 1925; Kulkow, 1926).

From higher concentrations there is in addition irritation of the respiratory mucous membranes, resulting in a dry tickly cough and a sense of constriction in the throat. If exposure is continued the victim becomes ataxic, drowsy, and dull, and may complain of headache, vertigo, nausea, weakness, and irritation of the skin. The vision is blurred, and a burning pain is felt in the chest and abdomen and a feeling of pressure over the heart. In addition there may be tonic contraction of the flexors of the hands and twitching of the muscles of trunk and limbs (Rudd, 1944).

When still greater concentrations are present there is disorientation. The victim shouts abuse at those around and adopts a pugnacious attitude, so that his rescue is fraught with danger both for himself and for rescuers, who may forfeit their lives in the attempt. Hallucinations may be present. If exposure continues, delirium and coma supervene, and there are tonic and clonic convulsions—sometimes in one limb at first, later generalized. Convulsions may not appear till the victim has been removed to the fresh air (Machle, 1941).

If removed to a normal atmosphere the patient may recover quickly if exposure has been short, but later he falls into a deep sleep, from which, however, he can be roused. If exposure has been more prolonged coma may continue for several days and terminate even then in respiratory arrest. As the coma lightens, twitching of the arms and legs may occur, so that the limbs beat against the floor and the teeth chatter violently as though in a rigor. As consciousness returns vomiting sets in, headache is severe, and there is throbbing pain in the abdomen and in the extremities. The patient remains confused for many hours, however, and may relapse into coma from time to time. He is emotionally unstable, and may become pugnacious, throw himself about, or burst into hysterical laughter. When recovery finally ensues it is usually rapid, though vomiting, abdominal pain, and headache may persist for several days and stupefaction and inertia for a week or more.

If the concentration of the vapour is very high the victim falls to the ground unconscious almost immediately, and if not promptly rescued dies of respiratory arrest (Rambousek, 1913).

Physical Signs

Cyanosis is usually present during the stage of coma, and may be deep; the breathing is laboured and stertorous, and the skin cold and clammy. The pulse in the early stages is rapid and weak and may be irregular, but when motor unrest is present it becomes full and bounding. Later, pulse and respirations are slow and feeble and the temperature subnormal. The blood pressure falls as peripheral failure supervenes. Acrocyanosis may be marked. The pupils are dilated and may be unequal, and conjugate deviation, strabismus, or nystagmus is often found. The tendon reflexes are diminished or absent in

quiet coma, but when convulsions and motor unrest are present they are often exaggerated, the plantar responses extensor, and clonus present. There may be neck rigidity (Machle, 1941; Plummer, 1913).

The urine sometimes contains traces of albumin and sugar. Unlike benzol, petrol and benzine are not excreted in the urine in conjugation with sulphates (Wichern, 1909). A blood count often shows a moderate reduction of haemoglobin and erythrocytes, and an increase of bilirubin in the serum, but there may be haemoconcentration. A polymorph leucocytosis is frequent and the percentage of eosinophils may be increased. Blood changes are, however, not prominent as in benzol poisoning. Sometimes there is a rise of blood urea, but not sufficient to cause confusion with uraemia. The cerebrospinal fluid is not altered.

Prophylaxis and Treatment

Prophylaxis.—Where petrol is handled in enclosed places adequate ventilation must be assured, so that, when exposure is likely to be prolonged, concentrations of 1 part per 1,000 are not exceeded. Too much faith should not be placed in an oxygen-breathing apparatus, especially when the concentration of petrol vapour is likely to be high, as the fumes have great penetrative power.

Treatment.—The victim should be removed at once to the fresh air. If breathing has ceased, artificial respiration will be required, and oxygen, if available, should be given, preferably with 5% of carbon dioxide. The clothes, as they are saturated with petrol vapour and may be contaminated by the liquid, must be removed and the skin cleansed. Sedatives are required if there is much restlessness, paraldehyde or chloral hydrate generally sufficing. In very violent patients intravenous pentothal may have to be used. A dose of 0.5 g. dissolved in 10 c.cm. of distilled water is injected slowly till a quiet sleep has been procured. The remainder of the dose is then injected intramuscularly to prolong the action of the intravenous dose. Careful supervision must be exercised during the first four days lest respiratory arrest, circulatory failure, or convulsions supervene. In circulatory failure adrenaline should be avoided, as it tends to cause pulmonary oedema (Machle, 1941).

Pathology

The macroscopic changes are found for the most part in the lungs, which are hyperaemic and oedematous and show petechial haemorrhages and extravasations of blood. The bronchi are inflamed. There may also be haemorrhage into the serous cavities and the subserous tissues, and into the mucosa of trachea, gastro-intestinal tract, and bladder. The meninges, brain, and spinal cord are hyperaemic and oedematous, and show petechial haemorrhages. The kidneys are oedematous. Histologically, cloudy swelling and fatty degeneration are found in the liver and in the proximal convoluted tubules of the kidneys. The cerebrum is congested, and there are perivascular extravasations of blood. The nerve cells of the brain and spinal cord show chromatolysis, loss of lipoid, and dendritic degeneration. There is swelling or disappearance of myelin (Jansen, 1937; Machle, 1941).

Sequelae

Mild neurasthenic symptoms, such as headache, sleeplessness, and anorexia, are common after petrol poisoning. Evidence of organic change in the nervous system is, however, not infrequent, particularly epilepsy (Floret, 1927), but also lesions of the pyramidal, cerebellar, or sensory tract simulating disseminated sclerosis or other organic nervous disease (Potts, 1915). The signs may be of scattered lesions or be hemiplegic or of more local distribution. Memory and intellect may be impaired. Sometimes the peripheral nerves are involved, often only a single nerve, such as the sciatic nerve (Jansen, 1937) or one of the cranial nerves, such as the hypoglossal. Retrobulbar neuritis has been recorded. These symptoms and signs may not become evident for several months after the accident, and recovery may take many years, or the disability be permanent. An early and fatal complication described by Floret (1927) is necrosis of the skin of the face and of the mucous membrane of the mouth and throat, following an erysipelas-like eruption. Pneumonia may occur, but is more common after the inhalation of liquid petrol—as when it is drunk—than of vapour.

Summary

Two cases of acute poisoning due to petrol vapour are described. The aetiology, clinical features, and pathology are reviewed.

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MONO-ARTICULAR OSTEO-ARTHRITIS OF THE HIP

TREATMENT BY ACID INJECTION

BY

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During the past nine years I have treated over 1,200 cases of arthritis by intra-articular acid injection, comprising chiefly those of osteo-arthritis, of traumatic arthritis, of so-called "menopausal" arthritis, and of rheumatoid arthritis in the residual deformity stage. Owing to war conditions, effective statistical analysis of results has been impossible; it may, however, be legitimate to gauge the value of the treatment from the increase in the number of patients referred to my two hospital clinics annually—from 56 in 1940 to 186 in 1944. I estimate that over 70% of cases of all types have been rendered free from pain and with sufficient restoration of function to allow of a return to their normal occupation.

Mono-articular arthritis of the hip-joint, however, occupies an unenviable pedestal of intractability among joint affections. According to MacMurray (1943), "local treatment of the affected joint by hot packs, hot mud packs, radiant heat, etc., results in a more or less temporary relief of pain, but produces little interruption in the progress of the disease. Electrical treatment by ionization has proved to be of little or no value, and its use is followed in some instances by a considerable increase in the pain and tenderness." Manipulation has its advocates for early cases; fixation by plaster or other support will give relief from pain; deep *x*-ray therapy is said to effect improvement in about 10% of cases—the Freiburg authorities claimed that 33% of their cases were relieved by deep therapy. As none of these measures has in my experience arrested the disease process and has rarely returned the patient to economic circulation, it seemed that an analysis of the condition of the cases treated by joint acidification in one year might afford some indication of its usefulness or otherwise in this baffling disorder.

The rationale of acidification of arthritic joints is based on my observations on the *p*H of synovial fluid in various conditions (Waugh, 1936, 1938): in chronic osteo-arthritis of the hip this appeared to be consistently on the alkaline side—even as high as 8.8. It has been shown by Smith-Petersen that the use of the vitallium cap after excision of the head of the femur

is followed by the generation of a layer of fibrocartilage in the acetabulum and over the stump of the neck: I have not so far been able to obtain a similar specimen from the hip-joint after acidification; but examination of the cartilage removed from the head of the tibia in a case of osteo-arthritis of the knee, which had received a long and successful course of this treatment, showed a covering of fibrocartilage 1/32 in. thick, covering the whole weight-bearing surface.

Warren Crowe (1944) has reported his results in 400 cases of all kinds, using acid potassium phosphate. I prefer lactic acid, as more closely approximating a natural acid found in the tissues: some difficulty was experienced in obtaining a stable preparation of constant *p*H, but this has been overcome.

Technique.—Briefly, the technique consists of (1) an injection each week of 15 to 20 c.cm. of a solution of lactic acid of a *p*H of 5.8, together with procaine, into and around the joint; (2) followed by very gradual manipulation, and flexion-abduction-extension exercises, without weight-bearing, consistently and perseveringly carried out by the patient.

Analysis of Cases

The cases described are of the hospital out-patient class, referred to me either by the physiotherapy department or directly by their own doctor. In all, 142 cases have been examined and 108 treated in this way during the last five years. Owing to removals, bombing, and other causes, I have not been able to attempt a complete follow-up of these cases: I have, however, investigated the result obtained in 26 consecutive cases which were referred to me in the year 1942; and I find that between 50 and 60% of these patients obtain enough relief from pain and recovery of function to be able to carry on their normal occupations, including housework and shop assistant's work in women, and shipyard work—riveting—and even in two instances coal-hewing, in men.

In this condition it is extremely difficult to establish any scientific criterion of success or failure of treatment. Pain, the patient's chief disability, is a subjective matter; with the possible exception of the demonstration of the narrowed joint space, radiography is an indifferent guide to the clinical condition; nor does limitation of range of movement bear any constant mensurable relation to the clinical condition. For a number of years I have made my own percentage assessment of the degree of overall disability. For example, when a patient is for all practical purposes confined to bed he is assessed at from 90 to 100% disabled; others able to get about, but with considerable difficulty, at 70 to 80%. These assessments are entered on the patient's case-sheet at the beginning of treatment, while on completion a final assessment of the degree of disability remaining is made. While this is a purely clinical method of estimation and dependent on the surgeon's personal observation, I find it the most useful means of ascertaining whether the patient has improved under treatment.

Discussion

The chief contraindication to suitability for this form of treatment is extreme loss of joint space, particularly in the outer and upper quadrants of the joint, as seen by radiographs. The amount of osteophytic outgrowth does not in itself, however, govern the suitability of the case for acidification. Extreme loss of joint space indicates extensive destruction of the articular cartilage, and, apart from the unlikelihood of obtaining effective regeneration of joint surface by fibrocartilage, the mechanical difficulty of reaching the space of the joint with the needle is almost insuperable. Five of the 26 cases come into this category, of which two were successfully dealt with by oblique osteotomy; no treatment was given to the remaining three. Three cases failed to continue treatment after the first or second injection, and must be written off. Of the remaining 18 cases, all of which I have examined within the last few months, four were in-patients and carried out what I regard as the complete course. These are naturally the most successful. Three appear to be almost completely free from symptoms: one, a housewife who had been confined to bed or a chair for a year previous to treatment, is now fully active, does all her housework, and can stand in queues and do her shopping. By her own account she is practically free from pain or any disability. There is still some limitation of range of movement, particularly inward rotation. Her original classification was in the 90 to 100% class; I estimate her total disability now as under 10%. The two remaining male cases were those of a coal-miner and a slinger at an ironworks; both are free from pain, but have rather greater limitation of range of movement; they have returned to full work at their heavy occupations. The fourth case is a failure; for a year after finishing treatment this patient continued fairly well, but his condition has since deteriorated. The remaining 14 patients—nine men and five women—were treated purely as out-patients. The average disability figure at the first examination I put down as in the region of 60%; only three (men) are relative failures, in that after completion of treatment the disability figure is still in the region of 40%. The other 11 are all sufficiently recovered to carry on a useful existence, and, in several cases, hard physical work, without complaint of pain; their average remaining disability figure I put at well under 20%. Two of them have returned in recent months, as they felt they were getting more pain. They have been given a further course of six injections; this appears to have cleared up any return of symptoms.

Results in 18 Cases of Mono-articular Osteo-arthritis of the Hip treated by Joint Acidification

	No.	Results		
		Very Good	Good	Poor
In-patients	4	3	0	1
Out-patients	14	4	7	3

It is not easy to obtain a solution which remains constant; I use that made for me by Brady and Martin, Newcastle-upon-Tyne, which is reliable.

Summary

The method of treatment of osteo-arthritis by intra-articular acid injection is outlined.

Non-operative methods of treatment of mono-articular osteo-arthritis of the hip are itemized.

The results of acid injection in 18 cases are analysed.

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TORSION OF A PEDUNCULATED GASTRIC CYST

BY

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AND

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Cysts of the stomach are rare and few cause symptoms. We describe in detail one case of clinical importance and mention three others in a short discussion upon gastric cysts.

Case Report

Clinical History and Examination.—A woman aged 62 had felt rather full in the abdomen for two years and had noticed a swelling in the right iliac fossa for about four months. She had been troubled with constipation and hiccups also. On palpation of the abdomen a freely movable globular tumour about the size of a grapefruit was found. It was not tender and could be pushed right up under the costal margin. A long-pedicled ovarian cyst was diagnosed and its removal advised.

On laparotomy the tumour proved to be a cyst in the peritoneal cavity with a long pedicle attached to the greater curvature of the stomach. The pedicle was twisted about five times, and the cyst, although not necrotic-looking, was discoloured in places. There were patches of fibrinous exudate and a portion of lightly adherent omentum upon its surface. Muscle fibres of the muscularis of the stomach were observed running from the greater curvature right down the pedicle to the cyst wall. The cyst was removed without difficulty and the patient made an uninterrupted recovery. Subsequent questioning yielded no information indicating when the torsion had occurred.

Pathological Examination.—The specimen consisted of a cyst 11 by 10 by 7.5 cm., the outer surface of which was greyish blue

smooth, and marked prominently by veins, and a flat layer of adipose omentum was attached over an area 18 by 14 cm. The wall consisted of greyish-white or brown tissue from 1 to 5 mm. thick. The content was a sepia-coloured fluid and clotted blood in about equal amounts. Most of the clot was deposited upon the inner surface of the cyst, and it contained several fragments of grey tissue up to 1 by 0.5 cm. The wall was composed of connective tissue, which in most places was loose and oedematous and in others fibrotic. In a few places in the wall there were bundles of smooth-muscle fibres, but epithelium was everywhere absent. There were foci of lymphocytes, plasma cells, and eosinophil leucocytes, and many patches of recent haemorrhage; evidence of old haemorrhage in places was shown by intracellular or extracellular granular haemosiderin and haematoidin and by impregnation of collagen fibres with ferric and ferrous salts which stained deeply with Ehrlich's haematoxylin. Numerous spindle-shaped areas of proliferated cells and relatively little collagen lay in the wall. The majority of the cells were spindle-shaped, but others appeared to be spheroidal, and in most the cytoplasm was vacuolated or diffusely dropsical. Some of the cells in a few spindles could be identified almost certainly as muscle cells, but the remainder were undifferentiated. In parts of the wall containing bundles of muscle fibres the spindle-shaped thickenings lay in close association with the bundles. No axis cylinders could be seen in the spindles in Bielschowsky preparations. The spindles appeared to result from regeneration of muscle by proliferation of undifferentiated connective-tissue cells, the differentiation into muscle cells being abortive. The haemorrhage in the wall of the cyst was continuous with the deposit of clot upon the inner surface, and the fragments of grey tissue in the clot were spindle areas of cellular proliferation which had become separated off from the wall as the result of haemorrhage.

Discussion

Many gastric cysts in cases reported in the literature were symptomless and were discovered at necropsy. Others gave rise to symptoms which appeared in infancy or at some later age, even in late adult life. Symptoms were variable, but abdominal pain, vomiting, loss of weight, and swelling of the abdomen were the most common. In no reported case was torsion described, but in Tchernisher's case (according to Gray and Wood, 1938) the cyst was attached to the stomach by a long stalk as in our case. Haemorrhage had occurred in the wall of the cyst in the cases of Weichert (1929) and Ladd and Gross (1940), but its cause was not mentioned.

The size and number of cysts occurring in any reported case varied. Three cysts were present in the Cabot case 14242 (1928) and Pancotto's case (1927); and in that of Askanazy (1923) there were numerous cysts. Askanazy described very minute cysts, and Tchernisher (according to Gray and Wood) one the size of an adult head.

According to structure there are four types of gastric cyst. The most common type is the *enterogenous cyst*, which lies in the muscularis mucosae, submucosa, or muscularis in any part of the stomach, but particularly in the pyloric region and commonly at the greater curvature. They probably arise from epithelium separated off from the gastric mucosa during development, but growth of this epithelium into cysts may occur at any time of life. Bikoff (1938) ascribed the origin of a cyst—the size of a hen's egg—which had been removed from the greater curvature to the duct of ectopic pancreatic tissue. It was more likely to be enterogenous, since it was lined with a layer of columnar epithelial cells and a few gland-like structures lay in a subjacent layer of connective tissue. Enterogenous cysts are lined with a single layer of epithelial cells, columnar in most, and they lie upon a layer of connective tissue which in some instances contains a variable number of tubular glands. The formation of well-developed typical gastric mucosa is probably uncommon. A muscularis mucosae is usually present. In the cysts of Wendel (1911), Ferraro (1942), Askanazy, and Pancotto the mucosa was of gastric type, while in the Cabot case the lining mucosa was described as being atrophic gastro-intestinal.

Enterogenous cysts lined with gastric mucosa are not limited to the stomach. Seydl (1938), for example, described such a cyst in the lower posterior mediastinum, and peptic ulceration of the cyst had caused perforation into a bronchus and fatal haemorrhage from an eroded artery.

The following is a description of two enterogenous gastric cysts which, although very small, probably represent the rests from which large cysts of clinical significance arise.

In a female infant of 1 hour, which had absence of the left dome of the diaphragm, diaphragmatic hernia, hypoplasia of the left lung, and coarctation of the aorta, a cyst, 3 mm. in diameter, projected into the greater omentum from the greater curvature at the junction of its middle and upper thirds. It lay in the muscularis and had a muscularis mucosae and a mucosa in which straight tubular glands were very few but like those in the stomach. In the other example a cyst, 3 by 1 mm., was found in the microscopical section of the pyloric region of a part of the stomach removed from a man of 61 because of chronic peptic ulceration. The cyst lay in the muscularis mucosae and was lined with a layer of cubical or short columnar mucous cells.

The second type is a *dermoid cyst*, in which there are two examples only. These cases were inadequately described by Gray and Wood (1938), and no histological data were given.

The third type is that *due to septa*, of which there is only one example. In this case (Metz, Householder, and De Pree, 1942) the cyst was the middle of three compartments of the stomach formed by two complete septa. Gastric mucosa lay on each surface of the septa.

The fourth type is that in which the lining is destroyed, so that the *origin is unknown*. Ladd and Gross described a cyst of this type lined with haemorrhagic necrotic tissue. Our cyst, which had undergone torsion, was of similar type, and the following is a description of another example.

A man aged 68 had had attacks of "the gastric," consisting of belching chiefly, for two years, and abdominal pain, loss of weight, and frequent vomiting for nine days before admission to hospital. A mass was palpable in the right upper quadrant of the abdomen. Death occurred from bronchopneumonia 10 days after admission. The lower two-thirds of the oesophagus had a rough, opaque, bile-stained lining, and microscopically the inner part of the wall was necrosed and undergoing peptic digestion, but the muscularis mucosae was hypertrophied and ghosts of cells probably indicated that inflammation had been present. Mild oesophagitis and cardiospasm probably accounted for the gastric symptoms. A cyst, 8 by 6 cm., lay in the pylorus and had a thin wall of fibrotic connective tissue in which there were few cells in most places and slight lymphocytic infiltration in others. The inner surface was necrosed and undergoing digestion in places. The anterior part lay in the submucosa, but posteriorly the cyst passed through the muscularis into adipose connective tissue to reach the anterior surface of the normal pancreas. The adipose tissue adjacent to the cyst wall showed areas of fat necrosis, which was of pancreatic type in that lipolysis and saponification had occurred. It was evident that the cyst contained ferments which had destroyed the lining epithelium and had caused the fat necrosis. The fact that the latter was of pancreatic type is insufficient evidence for one to ascribe the cyst to ectopic pancreatic tissue in the pylorus.

It is probable that cysts of this type, with absent epithelium, are enterogenous, and that the lining has been destroyed by ferments or circulatory disturbance.

Summary

A case of torsion of a pedunculated intraperitoneal cyst of the stomach, in a woman of 62, is described. The cyst was probably enterogenous, and an epithelial lining had probably been destroyed in consequence of torsion.

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The following statement on bread policy has been authorized by the Executive Council of the Food Education Society (29, Gordon Square, W.C.1): (1) The Food Education Society regrets that the Government has reduced the extraction rate of the wheat grain for bread flour to 80% on inadequate scientific and clinical data, especially at a time when the position in regard to food supply in general is so uncertain. (2) There is good reason to think that any reduction below 80% would be detrimental to the health of the people and should not be put into effect without further inquiry and experience. (3) The Society is strongly of the opinion that a specification for the post-war loaf is highly desirable, as in the case of other basic foods.

PATHOLOGY OF RUPTURED PLANTARIS

BY

G. BLUNDELL JONES, F.R.C.S.Eng.&Ed.

Captain, R.A.M.C.

Very little is known of the exact pathology of the lesion described as "ruptured plantaris" because the condition does not require operation and its morbid anatomy is therefore seldom seen. The following case report shows, however, that actual rupture of the belly of the plantaris muscle does occur, and that its clinical features tally exactly with the textbook descriptions of "ruptured plantaris."

Case Report

Sgt. X., aged 31, was admitted to hospital after an accident in which he had been thrown from a motor-cycle while travelling slowly. He complained of severe pain in the left calf region, and was under the impression that he had received a direct blow on the calf. Further questioning showed that he had slid across the road and been brought to a stop by the sole of his left foot hitting the kerb, thus producing forcible dorsiflexion of the ankle.

Examination revealed no evidence of direct injury to the calf, and there was no bruising. He was tender over the whole of the upper third of the leg posteriorly, but acutely so over the site of the plantaris muscle. There was a transverse incised wound over the tendo Achillis 2½ in. long, 3 in. above the ankle-joint. There was no other injury.

The wound was excised under gas-oxygen anaesthesia; the incision involved skin and fascia only, the tendo Achillis being exposed but showing no evidence of damage. On the medial side, a little deeper in the wound, it was noticed that the plantaris tendon was lying slack, and gentle traction upon it resulted in the delivery of the entire tendon and half the muscle belly ruptured transversely about its middle. The lower end of the tendon was detached and the whole removed. The wound was sutured.

Pain in the calf persisted for 2 to 3 weeks and staining of the skin of the leg by effused blood, with some oedema, appeared 3 days after the injury. Dorsiflexion of the ankle beyond a right-angle was painful for 4 weeks and was relieved by raising the heel of the boot. Physical treatment was aided in the early stage by local infiltration with novocain. (Campbell, 1938; Smiley, 1939.)

The wound over the tendo Achillis, which allowed the inspection of the plantaris tendon, was presumably incidental, as the deeper structures showed no sign of injury. The plantaris must therefore have been ruptured by indirect violence applied in dorsiflexion of the ankle.

Discussion

The clinical features of "ruptured plantaris" are well known. The average age of 8 cases seen by me was 30, and it is essentially a lesion of relatively young healthy tissues. Classically, a tennis player reaching back for a shot produces a forced dorsiflexion of his ankle; a sudden pain occurs, and he thinks he has been struck on the calf by his partner. Pain increases during the next few hours, and swelling of the leg followed by bruising is seen in 2 to 3 days. A painful acutely tender area over the plantaris muscle belly in the upper third of the calf is present at first, but later pain is felt only when the ankle is dorsiflexed beyond the right angle. The period of recovery lasts about three weeks.

The pathology of the lesion is the subject of much doubt. It is variously supposed to be a subcutaneous rupture of the plantaris tendon, a partial or complete tear of the muscle fibres or the musculo-tendinous junction of the plantaris, or a rupture of some fibres of the soleus or gastrocnemius muscles. The case described shows that, sometimes at least, the symptoms are produced by rupture of the plantaris muscle belly, and the following facts and observations support the view that the clinical syndrome is always so produced.

The plantaris is absent in 7.5% of subjects, according to Gruber, quoted by Quain (1892). Pilcher (1939) found the muscle absent or rudimentary in 16 of 100 consecutive post-mortem examinations, and states that the deficiency is more common in women than in men. The frequency of occurrence of the plantaris muscle is thus compatible with its presence in every case showing the classical clinical picture of rupture.

Greater tension per unit area is developed in the plantaris on forced dorsiflexion of the ankle than in the other calf muscles, because the length of the plantaris belly is only one-fifth of the total length of muscle and tendon; whereas one-half the total length of the soleus and gastrocnemius is composed of muscle fibres. I exposed the tendon in a number of cases for use as a graft in the repair of hernia, after the method described by Pilcher (1939). In each case, when the ankle was fully dorsiflexed the plantaris was seen to be as taut as a bow-string, while the tendo Achillis still showed elasticity. It seems reasonable to postulate, therefore, that in healthy tissues the sequence of events in increasingly violent dorsiflexion of the ankle is: (1) partial tear of the plantaris; (2) complete tear of the plantaris; (3) rupture of the other calf muscles in addition, or the tendo Achillis. Where the tissues are not healthy the order may be altered, as seen in the easy rupture of the tendo Achillis of elderly or syphilitic subjects. The first two of the above possibilities are the lesions occurring with the strain causing the "ruptured plantaris" syndrome.

An attempt was made to rupture the plantaris in a fresh young healthy cadaver by seizing the tendon with a haemostat and pulling. This caused rupture at the point seized, but when local damage was prevented by looping the tendon round a wooden peg, strong traction caused the muscle to tear through the middle of its belly. This, together with the findings in the case described, proves the weakest part of the muscle to be its contractile fibres.

The site of tenderness in 8 cases of "ruptured plantaris" seen by me was over the plantaris muscle belly. This is strong evidence pointing to the muscle itself as the site of the lesion.

Conclusion and Summary

The lesion described as "ruptured plantaris" is in fact a partial or complete tear of the fleshy fibres of the plantaris muscle. The case report correlates the clinical syndrome with a complete rupture of the plantaris muscle belly. The anatomical features of short muscle belly and long tendon cause this muscle to be subjected to greater tension than the other calf muscles—a fact which is well demonstrated by exposure at operation. The weakest part of the muscle is its belly, as proved by the experiment in the cadaver and the findings in the case described. The classical type of trauma causing the lesion in healthy tissues, together with the location of tenderness, distinguish plantaris rupture from other similar lesions.

I am indebted to Lieut.-Col. A. F. L. Shields, commanding officer of the hospital in which the case occurred, for permission to publish it.

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Medical Memoranda

Cavernous Sinus Thrombosis

There can be no doubt that treatment with penicillin has considerably improved the prognosis of cavernous sinus thrombosis. In a leading article in the *Lancet* (1945) it was pointed out that "chemotherapy is likely to cure just that type of case where the outcome was formerly almost hopeless—spread of infection from anterior veins draining a septic lesion of the face—because a lesion here is plainly visible, and any divergence from routine healing, or signs of more deep-seated mischief become rapidly obvious, so treatment can be begun in time." In addition, treatment with penicillin may result in a cure even when its administration has been delayed for any reason, and Johnstone (1945) has reported a case in which administration was not begun for 10 days, and yet the patient was completely cured.

It may be of interest to record the following case, in which penicillin was not given until 6 days after the onset of the illness, and in which recovery was complete.

Case History

Miss A., aged 23, a ledger clerk, was admitted to hospital on the evening of Jan. 12, 1945, as a case of erysipelas. The illness had begun suddenly on Jan. 8, with headache, limb pains, and vomiting. On the 9th she was put to bed, and since the afternoon of the 11th had been given a total of 6 g. of a sulphonamide. On examination she had an area of erythema extending from the right cheek to the forehead and spreading across the nose. It was extremely tender

and slightly raised. Both eyelids were oedematous. Her temperature was 103.2° F., pulse 120. She was immediately given 2 g. of sulphadiazine, followed by 2 g. 4 hours later, then 1 g. 4-hourly, with pot. cit. and plenty of fluids.

On Jan. 13 her condition was much the same, but her eyelids were more swollen—she could not open her right eye at all. The temperature was swinging between 99.2° and 101° F. during the day. At 10 a.m. on the 14th her temperature was 100.2° F. and the eyelids were worse. The right eye was definitely proptosed, and the left slightly so, and both showed early chemosis. She complained of feeling "dopy," was apathetic, and was rather slow in answering questions. A diagnosis of cavernous sinus thrombosis was made. At 2 p.m. the temperature was subnormal, but there were some petechiae on her eyelids and body. Treatment with penicillin was begun with a dosage of 20,000 units 3-hourly, intramuscularly. The sulphadiazine was discontinued. During Jan. 13 and 14 the patient had several rigors.

On Jan. 15 her temperature had risen again, there was marked chemosis of the conjunctivae of both eyes, with a blue discoloration of the eyelids, and she felt extremely drowsy. She complained that when she managed to open her eyelids a little she found that the vision of her right eye was blurred, but her left one was normal. Her pupils were small but reacted to light; and her external ocular movements were grossly restricted. It was impossible to examine the ocular fundi. Her general condition was worse, and a course of sulphathiazole was started—1.5 g. 4-hourly. All day she was extremely drowsy, with a swinging temperature.

On the morning of the 16th the temperature was normal. She still felt very drowsy, but had had 2 gr. of phenobarbitone in the early hours of the morning. Her eyes were painful but definitely less swollen, and the condition appeared much more localized. A boil on the right side of her nose was beginning to point—there had been no evidence of this previously, as the whole cheek had been swollen; hot fomentations were ordered. Her temperature rose again to 101.4° F. that night, and the next morning to 102.2° F. At this time the local condition was very much better and there was less chemosis, but a few fresh petechiae were present on the trunk and she complained of a stiff neck. All meningeal signs were equivocal. Her spleen was not palpable. By that night the temperature had dropped to normal and risen again to 100° F., and she was complaining of very severe pain in the head and neck. During the night there was a discharge of thick green pus from the boil on the nose, from which *Staph. aureus* was subsequently grown. The temperature was down again in the morning and the patient was much better subjectively. The sulphathiazole was reduced to 1 g. 6-hourly.

On Jan. 19, 20, and 21 the temperature was still swinging, but never reached 100° F. The eyes were practically normal. The sulphathiazole was stopped on the 19th, after a total of 34 g. had been given. On the night of the 22nd, the temperature having been normal for 36 hours, the penicillin was stopped after a total dosage of 1,320,000 units. On Jan. 23 the patient complained of double vision, and had a left external rectus paresis. On the 26th this was no better. The optic disks were apparently normal except for slight blurring of the nasal side of each. On Feb. 7 she complained of tenderness in the distribution of the right supra-orbital nerve, which had troubled her for about a week.

The patient was discharged on Feb. 14 feeling perfectly fit but for slight diplopia on looking to the extreme left, and with what she called her "old face again."

Discussion

But for penicillin this patient would almost certainly have died. Although no blood culture was done, the swinging temperature and the occurrence of petechiae and rigors indicated that she had a septicaemia. There may also have been meningeal involvement in view of the severe pain in the head and neck, with equivocal meningeal signs. Lumbar puncture was not carried out, as the pain was well relieved with 1/6 gr. of morphine and did not recur with the same severity; and little more could have been done therapeutically if it had been definitely known that meningitis was present, except perhaps the administration of penicillin intrathecally.

Prof. Garrod (1945) found that sulphathiazole *in vitro* "somewhat reduces the rate of disinfection by penicillin." Does the present case bear this out *in vivo*? Would the patient's condition have improved more rapidly with penicillin alone? The temperature had not come down to below 100° F. permanently until after the sulphathiazole was stopped; 36 hours after that it had become normal for good, and penicillin was discontinued 36 hours later. But probably the temperature would have settled just as quickly had the sulphathiazole been continued. However, with no bacteriological test and no apparent lesion causing the thrombosis in the early stages, it was not justifiable to do anything but give full doses of penicillin and a sulphonamide.

I am indebted to Dr. J. C. McEntee, acting medical superintendent, for permission to publish this case; and to Drs. Bamforth and Saward, of St. Thomas's Hospital, for generously supplying the penicillin.

Grove Hospital, L.C.C. BRIAN V. I. GREENISH, M.B., B.S.

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Reviews

ANTIMALARIAL DRUGS

Antimalarial Drugs. General Outline. By O. Temkin and Elizabeth M. Ramsey. (Pp. 110, with Bibliography. No price given.) National Research Council: Division of Medical Sciences. Issued by the Office of Medical Information (under grants of the Carnegie Corporation and the Johnson and Johnson Research Foundation). Washington. 1944.

The war in the Pacific compelled careful revision of our methods for controlling malaria, and the loss of Java and its quinine supplies necessitated the overhauling of our choice and use of antimalarial drugs. The present volume is a careful review of the information available in the published literature about such compounds, and it has been compiled as a basis for the revision which the military situation demanded. The first part of the work describes the quinine situation in wartime, the principles on which the antimalarial compounds pamaquin (plasmoquine) and mepacrine (atebrin) were discovered, and the general pre-war opinions about antimalarial drugs as set out in the Third and Fourth General Reports of the Malaria Commission of the Health Organization of the League of Nations, issued in 1933 and 1937 respectively. A list is included of the main compounds studied during the pre-war years, with indications of their action upon avian, simian, and human malaria. Detailed summaries are given of the literature concerning the pharmacology, antimalarial activity, and toxicology of quinine, mepacrine, and plasmoquine. Subsequent sections deal with other compounds, such as thio-bismol, which show minor degrees of antimalarial action. Nowadays, when new means are being sought to produce radical cure of *vivax* malaria, the summary of information about neoarsphenamine is timely. The antimalarial action of this compound is limited to *P. vivax*, and it does not extend to *P. falciparum*; and even with *vivax* malaria, although neoarsphenamine will usually cut short the immediate attack of malaria, most reports agree that it is no more effective than quinine or mepacrine in preventing a subsequent relapse. Antimonials, mercurials, amidines, and derivatives have all been reported to show antimalarial action under certain conditions, but in no case have the facts suggested that these compounds would be valuable for general clinical use. Owing to new information which has been gained since 1942, and which is still confined to confidential reports and military instructions, the section on "Treatment Plans of Malaria under Present War Conditions" is more valuable as history than as a guide to immediate conduct.

The review should prove valuable to the investigators who are now engaged in studying the use of the compounds under war conditions, and it is mainly for them that it has been compiled; but to the general student it would prove misleading on many points, for it omits all the newly acquired information, which is now restricted to confidential American and British reports, and which considerably modifies pre-war views in many particulars.

GENERAL THERAPEUTICS

The 1944 Year Book of General Therapeutics. Edited by Oscar W. Bethea, M.D., F.A.C.P. (Pp. 447; illustrated. 18s. 6d.) Chicago: The Year Book Publishers; London: H. K. Lewis and Co.

The *Year Book of General Therapeutics for 1944* is a useful book which can be strongly recommended to all doctors. It is small, well printed, and well written; it describes recent advances in treatment during the current year. The clarity of the exposition of difficult subjects is remarkable, and new procedures are described with caution and moderation. All the articles consist of summaries of published papers. The scope of the book can be gauged by a brief mention of some of the topics. There is a description of the use of caudal analgesia in midwifery: procaine hydrochloride in 1.5% solution is given by continuous drip by way of the sacral hiatus. There has been great enthusiasm for the method in the U.S., where it has been hailed as providing "dramatic relief of all pain" in labour. The book contains very useful sections on sulphonamides and penicillin, and a good account of the use of penicillin in syphilis. The treatment of burns is included, and antimalarial drugs have a section to themselves.

Janeway's work on the use of gamma globulin in measles is well described. This has arisen out of the work of Cohn

at Harvard on the fractionation of pooled human plasma, first undertaken to provide a concentrated albumin for the purpose of giving transfusions to wounded soldiers. It has also a medical use for patients suffering from oedema because of persistent albuminuria. As a by-product of the preparation of albumin, the antibodies present in the gamma globulin fraction of human plasma have been prepared. These are a substitute for convalescent serum or adult serum in measles prophylaxis. Adult serum may carry hepatitis or other diseases due to a filter-passing agent, and some doctors do not use it for that reason. The gamma globulins carry the protecting antibodies but are free from any infecting agent.

The book also includes a clear account of the Rh factor in blood transfusion. The great progress which enterprising and able American clinicians are making in therapy at this time is well illustrated throughout.

ORAL IMMUNIZATION

Oral Methods of Immunisation. By Burton Bradley, M.B., Ch.M., M.R.C.S. (Pp. 87. No price given.) Sydney: Deaton and Spencer Pty. Ltd.

The administration of bacterial vaccines by the mouth has continued for many years without gaining general recognition as an orthodox and reliable procedure, and at the same time without suffering utter condemnation as the reverse of this. It is notoriously difficult to prove the efficacy of such a proceeding statistically, in terms of expected attacks prevented, especially when the disease is a normally uncommon one, such as enteric fever. Another method of approach is barred to us by the unfortunate lack of any dependable method of estimating immunity to most bacterial infections: the presence or absence of an easily demonstrable antibody, such as agglutinin in the blood, is almost certainly not a full and true reflection of the degree of resistance of the body. In the present state of knowledge, therefore, anyone is entitled to his opinion on this subject, and Dr. Burton Bradley in a small book published in Australia and entitled *Oral Methods of Immunisation* pronounces very strongly in favour of this method. He rightly distinguishes between two different purposes for which oral vaccines may be given—the prevention or treatment of intestinal infections, on Besredka's principle of local immunization, and that of infections elsewhere, when it must be assumed that the antigen is absorbed and immunizes the body as a whole. Bradley advocates both, and claims success in treating rheumatism and infections of the air passages and of the skin. His own experiences are only briefly described, most of the book being occupied by a chronological review of the literature of this and closely related subjects. This is strongly partisan and rather uncritical, but may be found useful as a guide to some of the literature. The book contains an astonishing number of misprints, only a few of which are corrected in a list of errata: no fewer than 19 words are mis-spelt in a list of the names of 43 journals on a single page (87).

Notes on Books

Dr. D. HALER'S *Aids to Clinical Pathology* (Baillière, Tindall and Cox; 6s.) combines the functions of two previous books in this series, and covers the whole field of clinical pathology, including post-mortem technique, histology, haematology, microbiology, and biochemistry. No book of such size can be a complete guide to all these subjects, even for the elementary worker, but it contains much practical information. If we conceive the purpose of the book aright, it might be improved by recognizing that efficient work demands the use of other works on special subjects, and thus omitting descriptions of such things as animal parasites, and possibly even of individual species of bacteria, devoting the space so saved to fuller descriptions of methods of examining specimens.

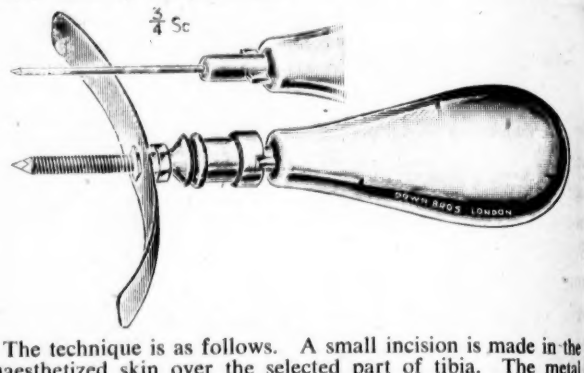
The Bacon Library of the American Hospital Association (18, East Division Street, Chicago 10, Illinois) has compiled a bibliography of the published writings of the late S. S. Goldwater, M.D. Dr. Goldwater, who died in October, 1942, was an outstanding hospital administrator. Although serving New York City as Commissioner of Health and later as Commissioner of Hospitals, the greater part of his professional life was spent as administrator of Mount Sinai Hospital in New York City. At the time of his death he was president of the Associated Hospital Service of New York City. He wrote on many subjects in the hospital and medical field. Copies of this 15-page bibliography may be had without cost from the Bacon Library.

Preparations and Appliances

A NEEDLE FOR INTRATIBIAL DRIPS

Dr. LESLIE A. GIBBONS writes from Redhill, Surrey:

The needle here illustrated has been made for me by Messrs. Down Bros. It consists of a hollow screw which can be screwed into the tibia (or sternum for sternal puncture) by means of the trocar-screwdriver. There are two nuts on the shaft of the needle. One nut holds a flexible metal strip and can be adjusted up and down the needle merely by twisting the nut. This is simply fixed by the other nut.



The technique is as follows. A small incision is made in the anaesthetized skin over the selected part of tibia. The metal strip is adjusted to the depth of needle required and fixed. The needle is now screwed into the tibia, fixed in position by bending the strip round the leg, and strapped by elastoplast or strapping. The trocar-screwdriver is removed and the drip connected as usual.

My thanks are due to Mr. Guy Drew, of Messrs. Down Bros., for arranging the production of the needle, and also to Mr. Norman E. Pitt, F.R.C.S.

AN OPHTHALMIC DRESSING

Dr. ALLAN H. BRIGGS, M.Sc., D.O.M.S., honorary ophthalmic surgeon, County Hospital, Lincoln, writes:

The standard form of dressing used in many hospitals for eye operation cases and injuries consists of Gamgee pads applied direct to the eye and held in position by a bandage. This has a number of disadvantages in practice. The pads tend to become soaked in serum or discharge, which adheres to any raw surface, and the soaked dressings tend to dry, forming a stiff adherent plaque, which can sometimes be detached only with difficulty. The stiffened dressings do not permit free drainage and they may become displaced, permitting the lids to be opened beneath them, sometimes with injury to the cornea of the eye beneath.

Experiments have been conducted for some time to try to devise a more satisfactory form of dressing, and it has been found that the use of a small piece of tulle gras applied direct to the injured eye beneath the Gamgee dressings is a very great advantage. The vaseline-impregnated net (in which sulphonamide or other drugs can be incorporated if desired) is easily applied and is comfortable in use. Its stickiness is sufficient to tend to keep the closed lids in position, and it permits the free escape of tears, serum, or discharge. Dressings can be easily removed and the tulle gras renewed if desirable.

No claim is made for originality in putting forward this suggestion, which must have been in use in many places already, and tulle gras is the standard dressing employed by many plastic surgeons for a number of years. The advantages and convenience of employing it as a routine dressing for ophthalmic operation cases and injuries are so marked I have felt it justifiable to give the idea some publicity in the hope that ophthalmic surgeons will find it useful.

In applying the tulle gras it is found that on cold days it is sometimes a little difficult to detach a suitable piece from the standard boxes of four-inch squares with delicate ophthalmic instruments. On the other hand, if the preparation is left to warm on a convenient sterilizer it is liable to be forgotten and too much vaseline melts out of the gauze. For convenience a special size of two-inch squares is being prepared for ophthalmic work, and they will be on the market shortly.

I have to thank the makers of several forms of tulle gras, notably Messrs. T. J. Smith and Nephew, and Messrs. Optrex, for providing material for experiment, and more particularly Messrs. Allen and Hanburys, who have been unfailingly helpful in preparing the standard two-inch-square dressings.

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BIOSYNTHESIS OF VITAMINS IN THE HUMAN GUT

It has long been known that some animals synthesize certain vitamins either in their tissues or through the agency of their intestinal flora. Rats, cats, and dogs do not suffer from scurvy; they make their own vitamin C. Synthesis of the B vitamins has been demonstrated in the rumen of herbivora and the caecum of the rodent. This synthesis is effected by symbiotic micro-organisms, such as the cellulose-splitting bacteria. If poorly absorbed sulphonamides, such as sulphaguanidine and succinylsulphathiazole, are given to rats fed on purified diets they inhibit the growth and metabolism of the intestinal flora, which then cease their synthetic activity. By the inclusion of these sulphonamides in diets containing known members of the vitamin-B complex it has been shown that the intestinal flora in the rat can synthesize vitamin B_1, riboflavin, nicotinic acid, pyridoxine, biotin, folic acid, pantothenic acid, and inositol.[1] A fall in the level of prothrombin in the blood occurs as well, showing that these sulphonamides interfere with the production of prothrombin, probably by inhibiting the biosynthesis of vitamin K in the gut.[2] The synthesis of vitamin E by the intestinal flora has also been demonstrated.[3] This synthetic activity of the bacteria in the gut has been confirmed by studies *in vitro*.[4]

How far do these findings apply to man? Does biosynthesis of some vitamins occur in the human intestine? The first human studies on the subject were made in 1943 by Najjar and Holt,[5] who gave nine adolescent males a synthetic diet adequate save for vitamin B_1, which was absent from the diet. Of the nine volunteers five showed signs of vitamin-B_1 deficiency and had no vitamin B_1 in the stools. The faeces of the remaining four, who kept quite healthy, were found to contain appreciable amounts of vitamin B_1, in spite of a zero intake. Succinylsulphathiazole, which is bacteriostatic in the bowel, was given to one of them, with the result that the vitamin-B_1 content of the faeces fell to zero. This was taken to prove that vitamin B_1 was synthesized by the bacteria in the gut. Absorption of vitamin B_1 from the large intestine was assumed to occur, as a retention enema containing the vitamin increased the urinary excretion of it. The validity of these studies has recently been challenged by Alexander and Landwehr,[6] who do not question the biosynthesis of vitamin B_1 in the gut, but doubt whether it is absorbed from it. They have demonstrated that the vitamin B_1 in human faeces is largely within the bodies of the bacteria and not free in the lumen of the gut; so it may not be absorbed. They also state that most of the vitamin B_1 is present as cocarboxylase, which cannot be absorbed unless first dephosphorylated by enzymes which are not present in the large intestine. Alexander and Landwehr also challenge the observation of Najjar and Holt that vitamin B_1 given in a retention enema is absorbed from the large bowel. They state that the amounts used by the latter—50 mg.—were not physiological, and that physiological doses, calculated on the amount of vitamin B_1 present in the average twenty-four-hour stool, are not absorbed from an enema. Najjar and Holt's claim that the vitamin B_1 synthesized by bacteria is available to the host is supported by the observation of Gant and his colleagues[7] that some 40% of the vitamins synthesized by bacteria can be extracted from the cells by aqueous media. The subject obviously requires further investigation.

Using a technique similar to that employed in the vitamin-B_1 experiments, Najjar and his colleagues[8] have produced evidence to show that biosynthesis of riboflavin occurs in the human gut. The subjects they studied excreted more riboflavin in their faeces and urine than they took in their food. Ellinger and his co-workers[9] have also recently announced the biosynthesis of nicotinamide within the human intestine. According to them, the amount of nicotinic acid synthesized by the bacterial flora in the gut may be as much as 80% of the estimated human requirements. It has been suggested that the confusional and mental symptoms and pellagroid rashes occasionally reported after treatment with sulphonamides may be due to conditioned nicotinic acid deficiency produced by the action of these drugs on the intestinal flora. Another explanation, and a more likely one, is that the sulphonamides interfere with the respiratory enzyme systems of which nicotinic acid and other B vitamins are components. These systems are concerned with the metabolism of carbohydrate, which is used exclusively by nervous tissue as a source of energy. The mental and nervous symptoms may therefore be due to anoxia of both central and peripheral nerve tissue.

What are the clinical implications of these observations on vitamin biosynthesis? If it is true that man can utilize the vitamins synthesized in the gut, our ideas on vitamin requirements may need revision. As Najjar and Holt have shown, the degree of biosynthesis that occurs varies considerably from person to person. This might explain the divergent views held by different authorities on the human requirements of the B vitamins. Henschel and Keys,[10] for example, kept volunteers healthy on diets containing only 0.23 mg. of vitamin B_1 per 1,000 calories daily, yet others have reported deficiency symptoms on intakes greater than this. The National Research Council, U.S.A., recommend a daily intake of 0.6 mg. per 1,000 calories. There is also disagreement among nutritionists over the human requirements of riboflavin and nicotinic acid. It would seem wise to give patients receiving sulphonamide

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[9] *Nature*, 1944, **154**, 270; *Lancet*, 1945, **1**, 432.
[10] *J. Nutrit.*, 1943, **26**, 399.

drugs supplements of the B vitamins, preferably in the form of high-potency yeast, which is rich in vitamin B_1 and riboflavin, and meat extracts, which are among the best sources of nicotinic acid. Disorders of the gut are often associated with symptoms characteristic of deficiency of the B vitamins. So-called "secondary" or conditioned pellagra has been recorded after such diseases of the alimentary tract as carcinoma, chronic diarrhoea, amoebiasis, intestinal parasitism, ulcerative colitis, and after short-circuiting operations on the intestines. Do these conditions produce deficiency symptoms by interfering with the absorption of the B vitamins, or is there some interference with their synthesis in the intestine as well? A conditioned deficiency of vitamin K, manifested by a low blood prothrombin and increased tendency to bleeding, may be produced in rats by the less soluble sulphonamides.[2] This is due to their bacteriostatic action on the intestinal bacteria that synthesize vitamin K. Haemorrhage, responding to vitamin K, has been recorded in patients given succinylsulphathiazole,[11] and it is also stated that the blood prothrombin is significantly decreased in patients taking sulphonamides.[12] Here is presumptive evidence of the biosynthesis of vitamin K in the human gut.

It was not so long ago that we all believed in the evils of intestinal stasis, with its "auto-intoxication" due to the supposed absorption of hypothetical bacterial toxins. The wheel of medical thought has turned full circle. The bacterial inhabitants of the intestine are no longer looked upon as toxin-producing parasites but as useful symbiotic organisms breaking down unwanted waste products such as cellulose and unabsorbed nitrogenous matter, and synthesizing, among other things, numerous vitamins and also protein.

LOBECTOMY AND PNEUMONECTOMY FOR TUBERCULOSIS

As long ago as 1822 Carson said of tuberculosis: "If this disease is to be cured it must be accomplished by mechanical means," and since then many mechanical measures have been employed, mostly indirect forms of attack such as compression, relaxation, and immobilization. Successful extirpation of pulmonary tuberculosis by lobectomy or pneumonectomy has, until recently, not appeared to be feasible. Since the establishment of these operations as standard treatment for bronchiectasis and carcinoma a number of cases of tuberculosis have been reported upon unwittingly, and the results were found to be so bad as to lead to condemnation of any deliberate attempts to excise a known tuberculous lesion. In 1935 Freedlander[13] reported a successful right upper lobectomy for tuberculosis, and the patient is still alive,[14] 10 years after, and "in fairly good condition." Since then a number of other reports of successful cases have appeared, notably those of Dolley,[15] and Jones,[16] and of Churchill and Klopstock[17]: these last two authors in a brilliant paper described 6 cases operated upon by lobectomy, all of which healed by primary intention.

What rapid strides have since been made is to be seen in the February number of the *Journal of Thoracic Surgery*, which contains a symposium of five papers devoted to this subject and a lengthy and most interesting discussion. The problem is clearly one of great complexity, and it is as yet not possible to make any final pronouncement on the success or even desirability of the new method of treatment. The work done so far is still necessarily of a pioneer experimental nature, but it has already been shown that the initial high mortality and morbidity in the sporadic cases operated on mostly in error need not occur. Churchill and Klopstock have, indeed, emphasized the fallacy of attempting to draw conclusions from this heterogeneous group of cases. Where the selection has been carefully made and a proper modern operation has been performed the results have improved so much as to place it within the realms of feasibility. In the early days of lobectomy and pneumonectomy when the tourniquet technique was being used it was inevitable that diseased tissue was left in the stump; this broke down, fistulae formed, and as a result severe empyemata and fatal contralateral spread of disease followed. With careful dissection technique so that the whole lobe or lung is removed and the bronchus accurately sutured this risk is not so much to be feared. Technically the operation in tuberculosis is said not to be so difficult as in many cases of bronchiectasis and malignant disease. In the above symposium Janes, of Toronto, mentions 32 operations with 6 deaths; Maier and Klopstock, 16 cases with only 1 death, and Bailey, 21 cases with 6 deaths. The largest series is reported by Overholt and Wilson, who have performed 61 resections on 61 patients between 1934 and 1943; their operative mortality was 15.8% (10 deaths) and their case mortality up to date 24.6% (15 deaths). These authors state that since January, 1942, when they began to use a more modern technique, they have performed 45 resections on 44 patients with only 5 deaths (11.1%); the case mortality to date for this series is only 13.6%. Moreover, they say that if this new series is divided into reasonable risks and desperate risks the operative mortality was 6.3% and 43.7% respectively. Chamberlain contributes a valuable paper on a comparison between the functional results of upper thoracoplasty and upper lobectomy. In the discussion of the papers there was some reluctance to accept resection as an alternative to thoracoplasty, seeing that the results of thoracoplasty are relatively better and the mortality lower. Most speakers felt that much was still to be learnt about dangers and indications, but, in the words of Alexander, "resection . . . has a definite place in the treatment of tuberculosis but that this place should be limited to relatively few patients for whom less risky operations which produce better results, are definitely not suitable." The indications for lung resection would at present seem to be: (1) If the disease is largely bronchiectatic and the tuberculosis not particularly active. (2) If there are cavities at the mediastinum, hilum, or lower lobe, where the prognosis for closure by other means is far from good. (3) If there are tension cavities that fail to collapse with artificial pneumothorax. (4) In some cases of persistent cavity after

[11] Gatch, W. D., unpublished data.
[12] Kapnick, I., *et al.*, *New Engl. J. Med.*, 1942, **227**, 944.
[13] *J. thorac. Surg.*, 1935, **5**, 132.
[14] Ibid., 1945, **14**, 52.
[15] Ibid., 1939, **8**, 351.
[16] Ibid., 1940, **10**, 102.
[17] *Ann. Surg.*, 1943, **117**, 641.

thoracoplasty. (5) In stenosis of the main or of a lobar bronchus.

Pulmonary tuberculosis is such a terrible disease if uncontrolled that this new attempt to add extirpation to our methods of attacking it must arouse great interest and not a little hope of providing a good result in some of those cases which in the past have failed to respond to the orthodox methods of treatment by rest, relaxation, or compression therapy. It is clearly a method that must be used only by the very experienced, and then guardedly and after all alternative simpler methods have been considered and rejected. At first thought it may appear to be so dangerous as to be generally unacceptable, but the results quoted above are good enough to demand serious consideration, especially as they are results obtained in the pioneer stages of the treatment.

RITUAL DEHYDRATION

"A Wine Cooper fell into a Dropsy which resisted all the usual Methods. This Man was prodigiously swell'd, Belly, Back, Sides, Thighs, and Legs. Being past all Hopes and having on him an inextinguishable Thirst, he was permitted to drink 14 Quarts of Water in about 10 hours and in al that Time made not one drop of Urine. Soon after he began to piss; and he drank on, 4 or 5 Quarts daily, and so recovered. . . . That Water should expell Water is a Miracle beyond any of St. Winifred's. Now no man in his Senses would have prescribed such a Water course to cure a Dropsy, which shows how little we know of Nature and the great Uncertainty of our Art."*

The orthodox treatment of oedema is by restriction of the intake of water and salt. The thirsty patient usually gets used to it and is supported and sustained by his physician's belief that a waterlogged patient can hardly need still more water. This ritual practice gains further support when it is seen that oedema sometimes increases when more water is drunk. Usually salt is restricted, because if salt is absorbed more water can be retained in the body. The logical conclusion of this practice seems to be that the waterlogged patient should be given no water at all. A kindly compromise is usual, however, and the patient is allowed one or two pints daily or else enough to minimize suffering from thirst. Oedema fluid, like normal interstitial fluid, may tend to become concentrated by evaporation of water from the body surfaces when intake is restricted. Normally, the changes being reflected in the blood stream, the kidneys work powerfully to preserve the electrolyte pattern, so that if water evaporates they excrete a stronger salt solution and the internal environment is repaired. The kidneys can perform this work only if they obtain an adequate supply of water. When oedema fluid contains too much sodium salts the tissue cells become dehydrated and "thirsty" and the patient wants water. If he gets it the water naturally goes to make the cell environment again isotonic and to rehydrate the tissue cells which were "brine-logged." This beneficial rehydration may thus be attended by an increase of the oedema, enough to make the faint-hearted falter. When the "thirsty" cells and oedema fluid are satisfied the kidneys can then proceed to the repair of the electrolyte pattern and the excretion of oedema fluid.

F. R. Schemm,[1] [2] reasoning on these grounds, has treated a large number of oedematous patients by giving them enough fluid to supply the necessary surplus for adequate renal function. To promote further the elimination of surplus sodium he restricted sodium intake and gave a diet designed to produce neutral or acid end-products. It was common, in his regime, to give several litres daily to patients with oedema associated with cardiac failure or in nephrotic syndrome supposedly due to lowering of plasma proteins. Cases of oedema with congestive cardiac failure seemed to tolerate five or six litres of fluid daily by mouth or supplemented by intravenous 5% dextrose; the oedema sometimes disappeared and the patient improved on the regime after rest, digitalis, mercurial diuretics, and water restriction had proved ineffective. Benefit has been claimed in nephrotic syndrome, in pulmonary oedema with left ventricular failure, and in stubborn anasarca with chronic rheumatic carditis. Even with these large fluid exchanges it was found that needed sodium chloride was conserved by the kidneys, and only the surplus was excreted.

Schemm's results are impressive and demand critical consideration. He recommends a modest and careful trial for the timid, and persuades the conservative with apt quotations to show that tradition favours the quenching of thirst, even in dropsy. "That Water should expell Water is a Miracle beyond any of St. Winifred's . . . which shows how little we know of Nature and the great Uncertainty of our Art."

HYPOGLYCAEMIC FATIGUE

Recent developments in the study of the neuroses, which have been greatly stimulated by the war, have drawn attention to the physiological basis of many neurotic symptoms. Such conditions as vitamin-B deprivation have been found to cause symptoms ranging from minor difficulties in concentration, neurasthenic and anxiety disorders, to severe psychotic states. On the other side organic lesions, such as gastric and duodenal ulcer, previously attributed solely to physical states, have been found to be influenced by such psychological factors as worry and strain. The growing belief in the interaction of mind and body, which by some still tend to be regarded as separate entities, has led our American colleagues to elevate "psychosomatic medicine" into a new specialty, in which medical and psychiatric factors are studied simultaneously in the same patient. Of some interest in this field is a recent study by Alexander and Portis[3] of hypoglycaemia as the basis of the neurotic symptom of fatigue. They investigated a group of patients who showed a fairly consistent syndrome. Normally active and energetic, they became ill after a change in their lives which involved application to work of a new and distasteful kind. Thereafter they developed attacks of fatigue which made them almost physically incapable of carrying on with the uninteresting occupation. The feeling of fatigue would be at its worst first thing in the morning, would be somewhat relieved by meals, and would pass off almost completely after the largest meal of the day in the evening. Glucose-tolerance tests showed in all patients a distinct flattening of the curve. Though the basal blood sugar was not below normal limits, the usual elevation after administration of glucose was not found. The curve would be restored to normal after a hypodermic injection of 1/75 gr. atropine. Good therapeutic results were obtained by psychotherapy, giving a diet containing no free sugar but complex carbohydrates, and an injection of atropine thrice daily.

* This quotation is from Sir Thomas Witherley, President of the Royal College of Physicians, 1684–7. The "usual methods," besides purges and vomits, included the use of calomel, mineral acids, and the muriate of ammonia, but not a free use of water, even from St. Winifred's Well.

[1] *Ann. intern. Med.*, 1942, **17**, 952.
[2] Ibid., 1944, **21**, 937.
[3] *Psychosomatic Med.*, 1944, **6**, 191.

The authors believe that the syndrome consists essentially in a disturbance of the homoeostatic regulation of the blood sugar. The feeling of zest with which the healthy man faces his daily activities represents a certain tonus in the vegetative system. A more enhanced tonus of the same kind is produced by feelings of fear and rage. If zest fails, the tonus drops and any sustained activity cannot be so well maintained. The patient tries to drive himself on to activities which cause a paralysing vegetative relaxation. Vagal preponderance results in a state of hyperinsulinism, demonstrated by the glucose-tolerance test. Administration of atropine diminishes the vagal tone and shifts the balance in favour of sympathetic tonus, and so helps to break the vicious circle.

METHYL BROMIDE POISONING

Methyl bromide (CH_3Br) has a molecular weight of 94; it is a colourless mobile liquid with a specific gravity of 1.732 at 4° C. and boils at 4.5° C. The specific gravity of the gas at normal temperature and pressure is 3.27. It has a faint but agreeable odour and is colourless. It is manufactured by heating methyl alcohol with sodium bromide at 130° C. in excess of sulphuric acid, and is then washed and condensed in refrigerator coils surrounded by brine. In the chemical industry it is used in the preparation of methylic compounds and for making colours from methylated tar. It has been extensively used in recent years as a fire extinguisher, a fumigant, a refrigerant, and a delousing agent. As an insecticide of great effectiveness it can protect a wide variety of foods, grain, plants, and textiles. Entomologists favour it for the control of pests because it leaves no smell or taste behind, it is not explosive on mixture with air, it is highly toxic to insects in all stages of their development, it has a low absorption and high penetrating power, and is inexpensive. It is particularly effective in the extermination of lice, bed-bugs, and weevils.

As so often happens, however, with substances which are really effective against insects it is also toxic to man, and in the last two years many cases of poisoning have been recorded both in this country and in the United States.[1-10] The toxic effects fall into three distinct groups: those brought about by pure gassing, the systemic effects of the vapour, and the effects on skin and mucous membranes. In the first instance death may occur from anoxaemia or toxic paralysis of the respiratory centre. Mild systemic effects include headache, giddiness, numbness, fits, diplopia, inability to accommodate, and vomiting; severe effects include signs similar to alcoholic intoxication with disorders of gait and co-ordination. Methyl bromide rapidly penetrates clothing, including leather and rubber, and irritates the skin and mucous membranes, producing burns characterized by enormous blisters full of sterile fluid. Depression and sleeplessness are frequent features of the convalescent period. Usually, symptoms run parallel to the non-volatile bromine level in the blood, which may be raised from a normal not exceeding 1.5 mg. to 10 mg. per 100 c.cm.; the bromine content in the cerebrospinal fluid may also be raised from a normal of 1 mg./100 c.cm. to 15 or more mg./100 c.cm. Death, when it occurs, usually results from pulmonary oedema; and post-mortem findings include acute purulent bronchitis, inflammation and oedema of the lungs, fatty degeneration of the ganglion cells of the brain, and degenerative changes in the kidneys.

Sayers, Yant, Thomas, and Berger[11] have investigated the toxicity of the substance in animals, and Irish, Adams, Spencer, and Row[12] have shown that methyl bromide is by far the most poisonous of the four organic halides—methyl bromide, methyl chloride, ethyl bromide, and ethyl chloride. Animals exposed to lethal doses die with pulmonary oedema or, if they survive long enough, with confluent bronchopneumonia; lower concentrations produce symptoms and changes like those already described for man. While a safe concentration for methyl bromide has not so far been established, it might be assumed that 70 parts per million would be the upper safety limit for short exposures and 50 parts per million for exposures of eight hours.

Once symptoms are established treatment is of little avail, and attention must therefore be directed to preventive measures. Here difficulties arise because the gas is odourless and can pass through the ordinary Service respirator in a quarter of an hour. Clarke, Roworth, and Holling[7] suggest that some substance with a smell be added to methyl bromide in fire extinguishers to draw attention to any leak. Certainly fire fighters who use these extinguishers should be warned against spilling the liquid and instructed that any clothing wetted by it must be removed immediately. When it is used as a fumigant the trucks, ships, store-houses, barns, or other buildings must be thoroughly ventilated on completion of the process. In industry the prevention of leaks, adequate dilution of escaping gas, and exhaust ventilation through the floor of the workshop are the most important preventive measures, but periodic medical examination will not only help in the detection of early symptoms but may draw attention to dangerous mechanical parts and lead to their repair. Bathing the hands in a weak solution of sodium carbonate may help to prevent skin lesions by decomposing the methyl bromide.

As has already been announced in the *Journal*, Dr. Charles Hill, Secretary of the B.M.A., is standing as an Independent candidate for Cambridge University in the coming General Election. Cambridge graduates will be receiving Dr. Hill's statement of policy in the election address he has written. When the new Parliament meets one of the early matters for debate will be a Bill for a comprehensive National Health Service. This Bill and the Act which will follow will be of the profoundest significance to all medical men and will shape the course of medical organization for many years to come. It would be a great advantage if there were on the floor of the House of Commons a medical spokesman who has at his finger-tips all the intricate details of the organization and administration of medical services. It is also much to be wished that there should be medical M.P.s who can represent—and not misrepresent—the wishes and aspirations of the majority of practising doctors in this country. For these reasons Cambridge medical men will do well to reflect upon the present phase in the history of medicine when they come to cast their votes.

The Mitchell Lecture before the Royal College of Physicians, which was arranged for July of this year, has been postponed until 1946. The Croonian Lectures will be delivered by Dr. Macdonald Critchley on Tuesday, July 10, and Thursday, July 12, 1945, at 4.30 p.m.

1 Watrous, R. M., *Industr. med.*, 1942, **11**, 575.
2 Miller, J. W., *Arch. Pathol.*, 1943, **36**, 506.
3 Gray, P. H. K., *J. roy. nav. med. Serv.*, 1944, **30**, 214.
4 Holling, H. E., and Clarke, C. A., ibid., 1944, **30**, 218.
5 De Jong, R. N., *J. Amer. med. Ass.*, 1944, **125**, 702.
6 Heimann, H., *Industr. Hyg. Bull.*, 1944, **23**, 103.
7 Clarke, C. A., Roworth, C. G., and Holling, H. E., *Brit. J. industr. Med.*, 1945, **2**, 17.
8 Wyers, H., ibid., 1945, **2**, 24.
9 Butler, E. C. B., Perry, K. M. A., and Williams, J. R. F., ibid., 1945, **2**, 30.
10 Carter, A. B., *British Medical Journal*, 1945, **1**, 43.
11 *Publ. Hlth. Bull. U.S. Treasury Dept.*, 1929, No. 185, Washington.
12 *J. industr. Hyg.*, 1940, **22**, 218; 1941, **23**, 408.

BIRTHDAY HONOURS

The names of the following members of the medical profession were included in a Birthday Honours List published in *Supplements* to the *London Gazette*.

Knighthood

JAMES DOUGLAS COOKE, F.R.C.S., M.P. for South Hammersmith since 1931. For political and public services.

SIDNEY VALENTINE SEWELL, M.D., F.R.C.P. Consulting Physician in the State of Victoria.

REGINALD WATSON WATSON-JONES, M.Ch., F.R.C.S. Civilian Consultant to the Royal Air Force.

C.B. (Military Division)

LEOPOLD THOMAS POOLE, D.S.O., *M.C.*, M.B., Ch.B. Major-Gen., late R.A.M.C.; Honorary Physician to the King. Director and Professor of Pathology, Royal Army Medical College.

C.M.G.

ALBERT VICTOR BERNARD, C.B.E., M.D., D.P.H. Late Chief Government Medical Officer, Malta.

GEORGE ERNEST HUGH LE FANU, M.D., Ch.M. Late Consulting Physician at Liverpool to the Colonial Office.

LUCIUS NICHOLLS, M.D. Director, Bacteriological Institute, Ceylon.

BENJAMIN STANLEY PLATT, M.Sc., Ph.D., M.B., Ch.B. Director, Human Nutrition Research Unit, Medical Research Council.

ALEXANDER MONTGOMERY WILSON RAE, M.D. Assistant Medical Adviser to the Secretary of State for the Colonies. Lately Deputy Director of Medical Service, Nigeria.

C.I.E.

KOMBAR RAMASWAMI KRISHNASWAMI IYENGAR, O.B.E., M.D., D.P.H. Lieut.-Col., I.M.S.(ret.). Late Director, Pasteur Institute of Southern India, Coonoor.

C.B.E. (Military Division)

WILLIAM INNES GERRARD, O.B.E., M.D., F.R.C.P. Acting Surg. Capt., R.N.(ret.).

THOMAS JAMES KELLY, *M.C.*, M.D. Acting Air Vice-Marshal, R.A.F.

D'ARCY POWER, *M.C.*, M.R.C.S., L.R.C.P. Acting Air Vice-Marshal, R.A.F.

ARTHUR EATON RICHMOND, O.B.E., M.R.C.S., L.R.C.P., D.T.M. Col. (Temp.), R.A.M.C.

C.B.E. (Civil Division)

Miss KATE FRASER, M.D., D.P.H. Commissioner, General Board of Control, Scotland.

BERNARD HART, M.D., F.R.C.P. Consultant Adviser in Psychiatry to the Ministry of Health.

JAMES RUSSELL, M.B., F.R.C.S.Ed., F.R.F.P.S. Surgical Director, Emergency Medical Service, Scotland.

ROBERT STANDISH-WHITE, O.B.E., F.R.C.S.I. For valuable services as honorary consulting surgeon, Rhodesian Air Training Group.

O.B.E. (Military Division)

ALGEO LLOYD ANDERSON, M.B. Surg. Capt., R.C.N.V.R.

JAMES MARTIN FLATTERY, M.B., Ch.M. Surg. Cmdr., R.A.N.

DAVID WALKER JOHNSTONE. Surg. Capt., R.C.N.V.R.

FREDERIC WILLIAM KEMP, *M.C.*, E.D., M.D. Lieut.-Col., N.Z.M.C.

WILLIAM PARSONS LAPPIN, M.B., Ch.B. Lieut.-Col. (Temp.), I.A.M.C.

CLARENCE LUCAN GRAY PRATT, M.D., M.Sc. Acting Temp. Surg. Cmdr., R.N.V.R.

JOHN ROWE, *M.C.*, M.B., B.Ch. Col., late R.A.M.C.

NORMAN LYON SHEPPERD, M.B., F.R.C.S. Lieut.-Col. (Temp.), R.A.M.C.

MALCOLM STODDART-SCOTT, *M.C.*, T.D., M.D. Lieut.-Col., R.A.M.C., T.A.

FREDERICK HAROLD VAN NOSTRAND, E.D., M.B. Col., R.C.A.M.C.

GORDON ABBOTT WINFIELD, M.D., C.M. Col., R.C.A.M.C.

O.B.E. (Civil Division)

AMAR NATH CHOPRA, M.B., B.S., D.P.H. Lieut.-Col., I.M.S. Inspector-General of Prisons and Director of Health, Orissa.

LAWRENCE WYLIE FITZMAURICE, M.D., C.M., F.A.C.S., Colonial Medical Service. Medical Officer and Bacteriologist, Bahamas.

NUTTING STUART FRASER, M.D., C.M. Consultant, St. John's General Hospital, Newfoundland. For public services.

ALISTAIR ROBERTSON GRANT, M.D. Medical Superintendent, Emergency Hospital, Whittingham, Preston.

HARRY HASTINGS, M.B., Ch.B. For medical and missionary services in Nigeria.

WILLIAM MALCOLM MCALISTER, M.B., Ch.B., F.R.C.P.Ed. Medical Superintendent, Bangour Emergency Hospital, West Lothian.

PETER JOHN MACLEOD, M.B., J.P. Medical Superintendent, Gleneagles Hospital and Fitness Centre. For services to civil defence. Capt., R.A.M.C.

Miss ALICE DEIRDRE KINGSNORTH PETERS, B.M., B.Ch. Senior Medical Officer, Royal Ordnance Factory, Chorley.

MOSES SENDAK, M.D., D.P.H. Lieut.-Col., I.M.S. Superintendent, Special Prison, Ahmednagar Fort, Bombay.

CHARLES MILLIKEN SMITH, M.D., D.P.H. Medical Officer of Health, Northamptonshire County Council. For services to civil defence.

Mrs. CLARA STEWART, M.B., B.S. Honorary Secretary and Organizer, Emergency Committee for Nurses, Leeds.

HERBERT WATT TORRANCE, *M.C.*, M.D. For medical services in Palestine.

M.B.E. (Military Division)

CHARLES BERNARD BALL, L.M.S.S.A. Major (Temp.), R.A.M.C.

JAMES MENZIES CLOW, A.M. (Gold), F.R.C.S.Ed. Major (Temp.), R.A.M.C.

WILLIAM ROBERT DUNLOP. Major, R.C.A.M.C.

CHARLES VINCENT SCOTT, M.B. Major, R.C.A.M.C.

M.B.E. (Civil Division)

Miss DEV PRIYA BALI, M.R.C.S., L.R.C.P., Women's Medical Service. Deputy Inspector-General of Civil Hospitals (Women), United Provinces.

PROBHAT KUMAR BISWAS. Civil Assistant Surgeon, Bengal.

Miss ALVA ADELINE DANIELL, M.B., B.S. Civil Assistant Surgeon, Civil Medical Department, Government of Burma.

DANIEL GEORGE SHIELDS, M.B., B.Ch. Area Air-raid Precautions Medical Officer, Norfolk.

JOHN EDWARD WRIGHT, F.R.C.S.Ed., F.A.C.S. Colonial Medical Service. Surgeon-Specialist, Holbarton Hospital, Antigua, Leeward Islands.

Kaisar-i-Hind Gold Medal

BRUCE LYMAN CARRUTHERS, M.D., C.M., F.A.C.P. Director, Medical Centre, Miraj.

Miss JESSIE FINDLAY, M.D. Principal and Professor of Surgery, Women's Medical College, Vellore, North Arcot District, Madras.

THE MEDICAL STUDENTS AT BELSEN

At a Press conference in London Dr. A. P. Meiklejohn, member of the Rockefeller Foundation Health Commission, who has been seconded to the Nutrition Section of the European Regional Office of U.N.R.R.A., described the work of the ninety-six London medical students whom he had the privilege of supervising at the horror camp at Belsen. He said that the first batch of students arrived on the last day of April, and the primary task allotted to them was the distribution of food for the starving. Until then the small number of British troops garrisoning the camp, which had been liberated on April 16, could do no more than deliver food from the cook-houses to the doors of the huts, where it was taken over by internees. The result of such a method was that, in the moral collapse which prevailed in the camp, those who were able to walk took all the food they could get and became desperately ill from overfeeding, while those who were too weak to leave their huts died because there was nobody to feed them.

How they tackled the Job

Each student took responsibility for one or more huts, comprising from 100 to 150 patients, together with about twice that number of internees at least well enough to feed themselves. The students saw to it that the food was fairly distributed. The students also set up a dispensary and started medical treatment. The daily death rate among the sick, which had remained at about 4% until May 1, fell in one week to half that figure, and in the second week to half again, and at the same time a new spirit was plainly discernible among the internees. One special body of 25 students created within the camp a hospital area in which the most seriously sick could be cared for under hospital conditions, pending removal. They showed the same vigour in the business of cleaning out filthy, verminous huts, "creosoting" the floors, and dusting it with anti-louse powder, as others showed in their more strictly medical occupations. So excellent was their initiative that within two weeks 1,200 patients had been washed, disinfected, reclothed, and returned to the renovated huts, where they were cared for entirely by the students and by volunteer nurses from among the more active internees. "It was a joy to see the change which took place in the patients," said Dr. Meiklejohn, "when they found themselves under proper ward conditions with adequate medical attention. There can be no doubt that the large majority of the patients in this students' hospital owed their lives to this achievement."

The last of the infamous huts was burned five weeks after the arrival of the first British troops in the area. For the remainder of the month the students were employed in medical work in hospital areas which now held the 12,000 surviving sick. "It is my personal belief that no other body of men

could have successfully accomplished the job which the students carried out." He spoke in appreciation of the help which the students received throughout their stay from the R.A.M.C. and the camp garrison, particularly from Lieut.-Col. J. A. D. Johnston, the senior medical officer, and Brig. Glyn Hughes, D.D.M.S., Second Army.

[Dr. W. F. Collis's preliminary report on conditions at Belsen Camp and the medical problems that arose was published in the *Journal* of June 9, page 814, and a letter by Brigadier Hughes, paying tribute to the medical students, on June 16, page 857.]

Correspondence

Determination of Age Incidence of Disease

SIR,—The *Journal* of June 9 (p. 797) contains an article on civilian dyspepsia by Drs. F. Avery Jones and H. Pollak recording *inter alia* what they refer to as "age and sex incidence" of peptic ulcers, accompanied by a chart. This, they say, "shows the maximum incidence for gastric ulcer between 40 and 60, but duodenal ulcer has an earlier peak at 35 to 39."

Surely it is time to insist that clinicians should use the term "incidence" as used in vital statistics to signify the ratio of observed cases to the appropriate population at risk. So defined, the age incidence of a disease is a true measure of liability to contract it at a given age. The figures cited by the authors of this article, like those cited in so many articles still published in medical journals, show nothing of the sort. The chart referred to simply exhibits the numbers of cases observed in each age group unrelated to the age composition of the population from which they were drawn. As such they merely indicate the risk that a patient will come under the observation of the observers at a given age if (*a*) the observers remain at the same hospital; (*b*) the population from which the hospital draws its patients maintains the same age composition.

The assessment of the age–strength distribution of the effective population of a hospital might be undertaken if a hospital had at its disposal an expert demographer with a thorough grasp of the social differentials involved in population structure. To the best of my knowledge no British hospital employs one. Within the framework of private practice any valid information about liability to disease in the civilian population at a given age is therefore confined to a handful of conditions which are either notifiable or quickly fatal.

On the other hand we have the necessary data for the Army population, because the Army population has an all-in system of social medicine. With the assistance of my colleague, Jun. Cmdr. M. M. Johnstone, M.A., I have recently made an exhaustive analysis of the true age incidence of some fifty major diseases, including peptic ulcers. The results would have been available for publication if the disclosure of basic data were not, for the present, subject to security regulations. The conclusion that the age distributions of gastric and duodenal ulcer are different, and that the latter has its peak at an earlier age, is correct; and this is not surprising since the effective population reservoir was presumably the same for both sets of cases. The peak ages of risk cited by the authors are not in agreement with the results of our analysis and can carry no weight as such for the reasons given above.—I am, etc.,

LANCELOT HOGBEN,
Deputy Director,
Medical (Statistical) Research, War Office.

Primary Atypical Pneumonia

SIR,—I feel some comment is necessary on the leading article on primary atypical pneumonia (April 7, p. 487), for such an article has wide publicity and influence, and it appears to me to leave a false impression of the disease. I would like to make the following observations based on a series of about 300 cases which have passed through my Division, situated in Italy during the past 18 months—cases which have been analysed with considerable precision.

1. Primary atypical pneumonia is not characterized by an influenzal onset; on the contrary, upper respiratory tract symptoms are absent. Cases giving a history of a cold followed by much coughing, expectoration, and central tracheal pain are descending infections of pyogenic or virus aetiology, and may cause bronchopneumonia or patchy collapse which is usually basal in situation, or influenzal pneumonia may so develop. Such cases are immediately distinguishable from atypical pneumonia by this very history.

2. To say that the disease may last from 3 to 5 weeks and that recovery is the rule is very misleading. The average duration of fever is 8.8 days, the mean range 7 to 10 days, with extremes between 5 and 15 days. Following subsidence of the fever convalescence is rapid and patients feel fit within a week thereof. Recovery is much more than the rule: there have been no deaths in this series, and such an outcome is extremely rare. Complications are equally unusual.

3. Cough is not invariable, but is entirely absent throughout the whole course of the disease in 12 to 15%. It is often mild, dry, and disturbs the patient but little, being quite different from the hacking distressing paroxysms of pyogenic bronchopneumonia. The sputum is not mucopurulent but characteristically mucoid. Purulence develops late in a minority which becomes secondarily infected, or it may appear early in patients who are already the subjects of chronic bronchitis. Conspicuous staining with blood occurs in 30 to 35%; it commonly appears between the 5th and the 7th days and may last from a few days to a week or so.

4. Symptoms referable to the chest are often absent apart from the cough mentioned: pleural pain occurs in about 20%; dyspnoea and cyanosis are rare; the respiratory rate is commonly within normal limits. These points are in contrast to the respiratory features of pyogenic pneumonias.

5. While it is true that there may be no physical signs in the chest, a careful physician will detect the tell-tale patch of crepitations in 80% of cases. These crepitations commonly appear first on about the 4th day and become obvious on the 5th day; they usually last a week or so. Dullness to percussion and bronchial breathing are rare, the former being noted in 10% of cases and the latter in but 6%. While it is true that the *x*-ray appearances are not diagnostic, they are nevertheless highly suspicious. As stated in the article under criticism, they are either diffuse homogeneous shadows or localized flocculent opacities, the two types being sometimes mixed. The situation of the lesion, however, is suggestive; it is segmental, occurs as often in the upper as in the lower lobes, and is not infrequent in the middle lobe or in its counterpart on the left side. Multiple lesions occurred in 12%; clinical lesions with negative skiagrams in 7%. The exact figures for distribution in my series were as follows:

	%	%
Upper lobe:		
Apical segment	2	
Pectoral ,,	20	42
Axillary ,,	20	
Middle lobe	16	16
Lower lobe:		
Dorsal segments	10	
Basal ,,	32	42

6. General symptoms are like those of any other high fever, with the emphasis mostly on headache and least on limb and back pains. Unlike the febrile stage of jaundice, abdominal pain is absent, but anorexia is not uncommon, and there is sometimes nausea or vomiting. Meningismus is very rare even in cases with gross headache, and the cerebrospinal fluid is normal. The spleen is sometimes enlarged, but this is of doubtful significance in a malarial country. The actual figure in this series was 15%.

7. The temperature chart was characteristic in 63% of the cases, showing a high irregular fever to about 104° F., with odd sharp swings of several degrees, sometimes occurring twice within 24 hours. The temperature had a tendency to keep returning to the same maximum figure. The end was rather sudden in 39% or it was by lysis. The fever was sustained in 13% and quotidian in another 13%. It was short-term in 7%, low-grade in 3.5%. Relapses, usually very short, occurred in 2%.

8. The white count is of course normal. The highest total in my series was 13,500, and only 7% were above 10,000; the maximum differential polymorph count was 80%, but the great majority lay between 50 and 75, only 8% being between 75 and 80. The erythrocyte sedimentation rate rises early and may measure 25 to 50 millimetres in one hour by the 3rd or 4th day. It may reach a maximum level of 40 to 70 during the second week, and then fall away to reach normality in about the 4th week. Cold agglutination tests were done on about 20 cases with entirely negative results. Both penicillin and sulphonamides have no influence on the course of the disease.

While it is agreed that atypical pneumonia may differ in its characteristics in various parts of the world in different epidemics, I doubt very much if the type seen in Italy, which has been so widespread among British troops and so uniform in its manifestations, is materially different from that seen at home in the last two years.—I am, etc.,

PAUL WOOD.
Lieut.-Col., R.A.M.C.
C.M.F.

Civilian Mass Radiography

SIR,—While welcoming discussion on the administrative aspects of mass radiography, we regret that current correspondence in the *Journal* should have been largely actuated by a misrepresentation in your leading article of April 14, which reviewed the recent M.R.C. report on civilian mass radiography, of which we are medical authors.[1] Taking some matter from its context, you accuse us of advising that "in doubtful cases medical directors of the unit must often decide from one interview and radiograph not only whether the subject has pulmonary tuberculosis but also whether the disease is active," and you comment that "anyone who has had experience in a chest clinic will realize the absurdity of this suggestion." Had you read the report with a little more care you would have observed incidentally that one of us does, in fact, administer a large chest clinic. On the particular point in question we suggested that in the initial medical interview (which, of course, includes a history and clinical examination, accompanied by a full-size radiograph) the medical director should take the responsibility of a decision only in cases where he is in no doubt, such as calcified primary or obviously healed apical tuberculous infection. After all, this is only what is done every day in ordinary chest clinic and out-patient practice. All cases where, however, there *is* a doubt should be referred for the fullest investigation, and, if indicated, prolonged observation, either at their local chest clinic or in the unit itself, according to local arrangements. Similarly, the classification of the cases recommended in the report takes cognizance of the results of this fuller investigation.

You also take us to task for failing to throw more light on the fate of the symptomless lesion. To provide such information would have necessitated a delay of publication for a year or more, whereas, as stated in the M.R.C.'s preface to the report, the first object was to discover the technical, administrative, and social problems arising from civilian mass radiography, and to establish provisional methods and procedures, in order to assist those responsible for the routine of the national scheme. This material had to be collected quickly, and it has formed the basis for the Ministry of Health organization which has trained the various local authority teams.

In your final paragraph you pose the question whether this new method is merely to be regarded as "an interesting toy, with a useful propaganda value, or is to be used as an instrument of scientific research." We submit that scientific research is incidental to mass radiography, but that enough is known already to establish it as a practical technique for detecting hitherto unsuspected sources of tuberculous infection on the one hand, and cases of early and treatable disease on the other. It should therefore become an indispensable adjunct of the antituberculosis service.—We are, etc.,

P. D'ARCY HART.
PETER KERLEY.
BRIAN C. THOMPSON.

[1] *Mass Miniature Radiography of Civilians for the Detection of Pulmonary Tuberculosis: Guide to Administration and Technique with a Mobile Apparatus using 35-mm. Film and Results of a Survey.* M.R.C. Spec. Rep. Ser. No. 251, 1945. H.M.S.O. (3s.)

Newer Concepts of Breast-feeding

SIR,—I have read the correspondence on breast-feeding with great interest, and have been impressed by the considerable divergence of views. I feel that much can be learned about breast-feeding by observing the instinctive actions and behaviour of the child before these have been influenced by the preconceived ideas of the nurse, mother, or doctor. Moreover, these observations can be well supported by comparison with the instinctive behaviour of young suckling animals.

It is commonly observed that a lamb will butt its mother's mammae before taking the nipple; a litter of piglets will appear to fight frantically over the sow's belly for almost a minute; then suddenly all will be quiet, and each piglet will be at its appointed place, fully occupied in swallowing the milk that is so rapidly and actively secreted. We do not find these very young animals attempting to suck milk from hard, engorged mammae, on which they can find no hold, or chewing the nipple. They massage and express the mammae until the inspissated secretions are forced out and the gland is pouring forth its milk freely.

The human infant, in a great number of cases, attempts to do the same thing, but is all too often suppressed by the nurse or attendant, and the mother is instructed that the child must not be allowed to "play" with the breast. The infant, even on the first occasion it is put to the breast, makes no attempt to feed, but, instead, starts to mouth or knock the breast by shaking its head from side to side, and only after doing this or making similar gestures does it attempt to suckle a breast, now suitably stimulated and softened, with milk or colostrum making its appearance. Usually, instead of this happy scene we see a busy nurse and a worried mother attempting to force a child to suck, and a thwarted baby being made to suck for ten minutes at an almost dry breast, thus causing the nipple to be overstretched and horribly chewed, thereby starting the vicious circle of cracked painful nipples and inadequate milk.

I would recommend the following procedure for the first forty-eight hours or until secretions of milk are established. The baby should be put to the breast and allowed to "play" for as long as it cares to, only being restrained from chewing the nipple. When it does start to suck it should only be allowed to continue for one minute at each breast. This, together with the massage when "playing," is enough to give the necessary stimulation to lactation, and remove colostrum without causing damage to the nipples. When the milk begins to be secreted in quantity it will usually be found that the child's instinctive actions before suckling will be sufficient to release the tension in the breast, and start the flow of milk *before* it starts to suck. If, however, these instinctive actions are not adequate or well developed they should be supplemented by the mother herself starting the flow of milk by manual expression, thus imitating the natural behaviour of the child or young animal. The loss of milk is insignificant, but this unnatural expedient should not be allowed to replace the child's natural and instinctive stimulation of the milk flow before suckling.

Both breasts should be fed at each nursing if maximum supply of milk is wanted, and I agree that the routine suggested by Dr. Michael Pallot (May 19, p. 714) is the best one to be followed. In support of the reason he puts forward it should be furthermore noted that many women with well-established lactations will actually secrete and lose a quantity of milk from the second breast while the first is being suckled, indicating that the stimulus to lactation is bilateral.

I have limited my reasons for suggesting the above systems to a physiological basis, but I feel that an equally strong case could be adduced for its support from the psychological angle. —I am, etc.,

C. R. NAISH, Flight-Lieut.
B.L.A.

Women in Labour

SIR,—From the recent correspondence on this subject it is apparent that the general consensus is in favour of analgesics in labour. It is also agreed that, for some reason, analgesics are not being given in this country to the majority of women in labour who require alleviation.

Various aetiological factors have been cited for the present lamentable state of analgesia in labour—e.g., "Youth at the Helm," young women medical officers of health, callous midwives, lack of apparatus, etc. I agree with Dr. Galley (May 12, p. 678) that the experienced midwife and medical attendant tend to become "conditioned to . . . imperfect analgesia—or none at all—in the labour ward," and are liable to sink into a state of apathy and conservatism if not occasionally stimulated by the natural reactions of the young inexperienced pupil midwife or medical student. From my knowledge of midwives I think it is grossly unfair to label them as callous and to lay at their door the failure of the medical profession, until recently, to provide them with an effective analgesic. This, of course, is the crux of the whole matter, and the only aetiological factor of importance. Provide an effective but harmless analgesic which can be administered by midwives by means of a simple apparatus—preferably foolproof—and the bogies of apathy, prejudice, callousness, etc., will disappear.

It has been stated in Whitridge Williams that, "in spite of advances in this field, the multipl.city of drugs and methods of their administration and the lack of uniformity in therapeutic response indicate that as yet we have no ideal method which produces complete alleviation of pain and at the same time is

entirely safe for both mother and child." Gas-and-air analgesia is safe in the normal case, but should not be used in cases of heart disease or toxaemia of pregnancy. But I believe that, even with care, adequate preliminary instruction, and intelligent co-operation, its analgesic properties are disappointing. In America interest in caudal analgesia has been revived—a certain indication of desperation. Anyone considering this method should first read Prof. F. J. Browne's letter (May 26, p. 746).

Dr. Galley refers to conservatism as a bar to progress. Here surely is an excellent example. Trichlorethylene has long been recognized as a potent analgesic agent. Hewer states that it exerts "the most potent and rapid analgesia of all the volatile drugs with which I am familiar, including nitrous oxide." Dr. Elam reported favourably on trilene analgesia in midwifery in the *Lancet* in 1942, and this was followed up by an excellent article in the same journal (Dec. 4, 1943) by Dr. A. Freedman describing his results in 190 cases using an inhaler of his own design. The inhaler is inexpensive, portable, foolproof, and has been proportioned to ensure that a mixture of trilene and air of only analgesic potency is inhaled. In his conclusion he states that "adequate analgesia safe for mother and infant was provided by the inhaler. There seem to be no contraindications to its use. It could be used by suitably trained midwives." He met with no complications due to this method of analgesia and suggested a wider investigation. Dr. D. C. Devitt also reports favourably on trichlorethylene in midwifery in the *Journal* of March 24 (p. 422).

On reading the replies to Dr. Elam's letter one is struck by the absence of constructive criticism and by the inference of Dr. Florence McClelland's question (April 28, p. 607), "How many of our number who undertake the care of an expectant mother have taken the trouble to make themselves thoroughly conversant with all the analgesic techniques at our command today?" No; trichlorethylene has only been mentioned to be condemned (Dr. W. J. Clancy, April 21, p. 565). I myself, I regret to say, have only recently started using trilene as an analgesic in labour. It has been used in my department for 80 cases. Freedman's technique has been closely followed and his inhaler has been used. In this short series of cases the findings have been as follows:

1. Satisfactory analgesia in over 90%. Quite a few patients were quite oblivious of the actual birth.
2. It can be given for long periods without ill effect—e.g., 7–8 hours.
3. No complications seen due to the analgesic and no ill effects in cases of mitral stenosis, toxaemia of pregnancy, and bronchiectasis.
4. The uterine contractions, pulse, blood pressure, and respiration rate were not affected.
5. Nervous patients relaxed well during the first stage and also during the delivery of the head.
6. Even when the analgesic effect was very marked and the patient became drowsy, very good co-operation was obtained. The patients were quiet and obeyed instructions. Occasionally during the second stage the patient used her accessory muscles of expulsion to better advantage if the inhaler was temporarily removed.
7. Very rapid recovery from analgesic; no after-effects.
8. Practically all the babies were born in good condition, and many cried lustily during or immediately after birth even in the cases of mothers who had inhaled trilene deeply and for long periods. One baby was smelling strongly of trilene but its respirations and colour were good. In any baby which was cyanosed or apnoeic there was always another explanation possible apart from the analgesic—e.g., cord tightly around the neck.

In conclusion I endorse all that Dr. Freedman has said and appeal for further trials with this excellent analgesic so that eventually it can be put into the hands of the much-maligned midwife, together with the blessing of the Central Midwives Board.—I am, etc.,

Leicester. D. R. CAIRNS, M.R.C.O.G.

Puerperal and Lactational Mastitis

SIR,—Following the article by Dr. A. A. Fulton (May 19, p. 693) it may be of interest to give similar figures for Birmingham for the past seven years. As in Dundee, the investigation has been made by means of notification by health visitors in addition to information received from midwives, hospitals, and nursing homes. Only cases showing suppuration are notified.

The incidence of mastitis appears to be very much lower in Birmingham than in Dundee. Although the percentage of cases occurring in patients delivered in hospital is greater than in patients delivered at home, it is still very small compared with the 16% found in Dundee. The incidence of mastitis for the City of Birmingham during this seven-years period (129,657 confinements) would appear to be 0.6%: that for cases delivered in hospital being 0.8% and for cases delivered at home 0.4%. The following table sets out the yearly fluctuations:

Year	Confinements at Home		Confinement in Hospital or Nursing Home	
	Confinements	Cases of Mastitis	Confinements	Cases of Mastitis
1938 ..	10,906	62	6,684	92
1939 ..	11,749	55	6,325	67
1940 ..	9,748	46	6,957	59
1941 ..	8,864	34	5,667	38
1942 ..	10,422	36	8,188	43
1943 ..	11,248	23	9,581	45
1944 ..	12,125	87	11,193	95
1938–44 ..	75,062	343	54,595	439

—I am, etc.,

City of Birmingham Public Health Department. V. MARY CROSSE, M.D.

Anaesthesia for Caesarean Section

SIR,—I have read with interest the letter by Dr. Kinkead Allen (June 2, p. 784) on the subject of anaesthesia for Caesarean section, but feel that any advantages of his technique are far outweighed by its possible complications. Even with great experience the abdominal field-block described is a time-consuming manœuvre, and during this time one would gather that "to prevent the parturient being distressed by the theatre display, needle pricks, etc. . . . she is kept from moving her limbs by the very lightest chloroform or vinesthene narcosis." Surely the dangers of light chloroform narcosis have been aired in public for many years, and a light vinesthene narcosis kept up for 20 to 30 minutes before the uterus is opened cannot fail to have some anaesthetic effect on the baby. Furthermore, Dr. Kinkead Allen gives his patients 15 mg. (1/4 grain) of omnopon or morphine before the operation, a practice which so far as I know is universally condemned in view of the very real danger of foetal apnoea.

I have yet to find a better anaesthetic for Caesarean section than nitrous oxide and oxygen, supplemented if necessary by di-ethyl ether, the only premedication being atropine 1/100 gr. True, a skilled administrator is necessary, but anyone who can give safely "the very lightest chloroform or vinesthene narcosis" should be able equally to administer gas-and-oxygen. In the classical operation I have frequently seen the baby born within 3 minutes of commencing the anaesthetic, and in the lower-segment operation there is usually only a 6–7 minute interval. The baby almost invariably cries lustily at birth, and the uterus contracts well. If it is so desired it is quite easy to have the patient conscious before she leaves the theatre.

The possible disadvantages of gas-and-oxygen are post-operative pain and restlessness and the absence of relaxation unless a dangerous degree of anoxia is permitted. The former is usually well controlled with a rectal drip containing 30 g. each of potassium bromide and aspirin; as for relaxation, the abdominal muscles have in any case been well stretched during pregnancy, and the majority of obstetricians do not consider that complete relaxation is necessary in Caesarean section.—I am, etc.,

London, E.C.1. J. KENNETH IRVING.

Atropine for Toxic Effects of Prostigmin

SIR,—The recent correspondence on carbachol and its antidote following the annotation in the *Journal* (May 5, p. 636) prompts me to send the particulars of the following case, where toxic effects of prostigmin were abolished by injections of atropine. Prostigmin differs in its action from carbachol in that it acts by antagonizing cholinesterase and thus increasing the action of acetylcholine. The toxic effects of prostigmin are similar to those of carbachol, though the action is somewhat different, the former acting by potentiating the acetylcholine already present, the latter by producing an additional acetylcholine-like stimulus. In both cases a muscarinic and nicotinic action will be obtained.

A boy aged 4½ was admitted for investigation and treatment as a case of megasigmoid, ? Hirschsprung's disease. He had previously had a colopexy done, but no improvement had ensued, so medical treatment was instituted, using the method of Klingman. Treatment with prostigmin orally was started, 5 mg. three times a day being given for two days and then 7½ mg. three times a day for two days. On the fifth day he had 10 mg. three times a day, the last dose being at 10 p.m. Until then there had been no effect. During the following night he slept well, with a normal pulse rate from 90 to 100. He was wakened at 6 a.m. and given a small soap-and-water enema. Following this he vomited four times and complained of abdominal pain. By 7 a.m. his pulse had become irregular, though remaining still at 90. He became increasingly pale and irritable and sweated considerably. The pulse decreased in volume and his face began to twitch. He seemed very shocked, and as the enema had had a moderately good result this was at first thought to be the cause, particularly as the symptoms had occurred so long after the last dose of prostigmin. He was watched until 11 a.m. His condition remained unchanged. He was then given 3 minims of adrenaline (1 in 1,000) and 1/150 gr. of atropine subcutaneously. The effect was very marked; the pulse improved and his colour returned within thirty minutes, and during the following hours he steadily improved and became more co-operative. At 2 p.m. he was given a further 3 minims of adrenaline (1 in 1,000) and 1/100 gr. atropine subcutaneously. By 5 p.m. he had fully recovered.

The toxic effects of prostigmin are discussed by Goodman and Bruckner, the latter personally having toxic effects after experimentally taking 45 mg. by mouth. Symptoms developed within two hours; slowing of the pulse was marked, dizziness, restlessness, and fear of impending death were symptoms and were associated with tremors and tonic contractions of muscles. Treatment with atropine 1/50 gr. intramuscularly restored the patient partially within 45 minutes and fully within two hours. —I am, etc.,

J. DONALD CRUIKSHANK.

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Formalin Treatment of Diphtheria Carriers

SIR,—In my annual report for 1939 to my Councils, I reported, among other matters, as follows:

I have instituted a treatment for diphtheria nose-and-throat carriers which is proving successful. The patients are given the treatment twice a day for approximately seven days, while in hospital, and are then swabbed prior to discharge—over 90% have been cured in seven days, the remainder after 14 days' treatment. The treatment is also given twice daily for approximately seven days, as below, without swabbing. My Council have agreed to pay 5s. to medical practitioners for this treatment for all *first contacts* of a diphtheria case.

The treatment is given at the patients' own homes and they are allowed to carry on their own duties while receiving the treatment, except in special cases of persons working in food stores and schools, etc. In these cases swabs are taken of direct contacts, and, if positive, they are removed to hospital.

Prescription for formalin special treatment as follows: Formaldehyde 11%, gelatin 2%, industrial spirit 15%, ol. menth. pip. 1%, aq. dest. ad 100%. This has been costed at the rate of 4s. per quart.

Special formalin solution for the treatment of diphtheria (nasal and throat) carriers: *For Nasal Carriers.*—Dilute 1 in 20—i.e., half a tablespoonful to half a tumblerful of warm water. *For Throat Carriers* and as a general preventive gargle.—10 drops of solution to a half tumblerful of warm water.

1. The patient should blow the nose hard.

2. A cotton-wool compress is lightly twisted with a point about 4 cm. long, so as to remain porous.

3. The plug is impregnated with a solution of formalin special treatment, 1 in 20, and the plug gently inserted well into the nose. The plug should remain in position for half an hour, and care should be taken to see that the patient does not move the plug from position.

4. During this time the patient should gargle with a solution of formalin special treatment (10 drops to half a glass of water).

5. At the end of half an hour the plug is removed. To avoid reinfection the patient must be forbidden to touch the nose. With children it may be advisable to bind the fingers with sterile dressing.

6. The treatment is repeated twice daily until at least one negative nose-and-throat swab is obtained. (Hospital cases only.)

In cases where the formalin treatment is unsuccessful:

1. A virulence test is carried out, and, if cases are non-virulent, these are discharged; if virulent, formalin treatment is continued or action taken as para. 2 below.

2. Certain children, having unhealthy tonsils or adenoids, are suitably operated on, resulting in negative swabs.

Since late in 1938 the above treatment has been carried out in my isolation hospital with great success; out of 39 nose and/or throat carriers treated 36 were negative (one nose-and-throat swab) after seven days' treatment; 3 were negative (one nose-and-throat swab) after fourteen days' treatment. In addition, many general practitioners in my districts have assisted me by carrying out with great success the treatment as outlined above. I have tried the "formalin treatment" in a few cases of haemolytic streptococcal carriers and meningococcal carriers with success. Perhaps others would care to try this treatment out, though I realize much research work has still to be done in the matter of "carriers" generally.

I have to thank Miss Minty, matron, Dutton Isolation Hospital, for the supervision of the treatment and the careful records kept.—I am, etc.,

E. N. HILLMAN GRAY, L.R.C.P.&S., L.M., D.P.H.
Medical Officer of Health, Runcorn Urban and Rural Districts; Medical Superintendent, Isolation Hospital, Dutton.
Runcorn.

Sexes in Dispersion of Intelligence

SIR,—I was much interested in Dr. Fraser Roberts's article on the difference between the sexes in dispersion of intelligence (May 26, p. 727). For many years the doctrine of greater male variability was regarded as a fundamental biological law and was believed to hold for all traits—physical as well as mental. Havelock Ellis wrote: "From an organic standpoint, therefore, women represent the more stable and conservative element in evolution . . . in men, as in males generally, there is an organic variational tendency to diverge from the average; in women, as in females generally, an organic tendency, notwithstanding all their facility for minor oscillations, to stability and conservatism, involving a diminished individualism and variability."

Karl Pearson was among the first to challenge the adequacy of studying sex differences in variability by a comparison of the extremes of the distribution. He called attention to the needs for direct measurement of variability around the average in large groups of unselected subjects. He and many others like Hollingworth and Montague found no clear evidence of greater male variability.

Dr. Fraser Roberts maintains that the result of the Scottish Council's survey and his own investigations put "all legitimate doubts at an end" and that "the existence of the difference is abundantly demonstrated." As selective factors are often difficult to detect and to control, I doubt whether even this careful analysis is fully convincing. For instance, can the difference in the developmental rate of boys and girls be lightly dismissed? Should not the developmental stage rather than the chronological age be the basis for comparison? In the sampling, has the difference of the social background and environmental stimulation been duly taken into account? Further, as sex differences in so-called general intelligence are probably attributable to differences in special aptitudes, could the apparent sex differences at both ends of the scale be due to the specific test material mentioned?

Group differences at high schools may be explained by the more rapid elimination of boys than girls; boys whose academic work is not satisfactory are more likely to leave school and go to work. The preponderance of males in institutions for mental defectives is probably due to the fact that house-work, prostitution, and marriage provide a means of livelihood for the feeble-minded woman, whereas boys in competitive work will much sooner reveal their mental deficiency.

Finally, as mental testing cannot provide any means of distinguishing between the effects of innate capacity and environmental influences on a person's general intelligence, it seems that much research will be necessary to ascertain the influence of different cultural *milieux* on the question of sex differences in variability of intelligence (cf. Mead, M., *Sex and Temperament in Three Primitive Societies*, 1935).—I am, etc.,

London, W.1. T. A. WERNER.

A Lesser Operative Procedure

SIR,—I was much interested in Brigadier Donald's article (June 9, p. 802) on a lesser operative procedure in the diagnosis of doubtfully penetrating abdominal wounds. It recalled an even lesser operative procedure I devised in cases of (?) ruptured malarial spleens, which were fairly common among the Asiatics in Malaya (in 1916). The method consisted of: (1) infiltration with local analgesic (subumbilical). (2) Insertion of a trocar with cannula. The withdrawal of blood was followed by immediate splenectomy.—I am, etc.,

SARAH WINSTEDT,
Factory Medical Officer, R.O.F.

Housing the Returned Consultant

SIR,—While sympathizing with Major H. B. Stallard (June 2, p. 787) I should like to put forward an alternative suggestion, that consultants should seek accommodation elsewhere, leaving Harley Street and the surrounding neighbourhood to the "others." Many of us before the war were paying high rents for accommodation in an area inconvenient alike to ourselves and to our patients, merely because of the "Harley Street tradition." It would be a good thing for this "tradition" to be broken, and for everybody to realize that a man (or woman) was a "specialist" on account of his (or her) professional qualifications, not on account of having a room in Harley Street.—I am, etc.,

T. W. PRESTON,
Lieut.-Col., R.A.M.C.

Ferring-by-Sea.

SIR,—Major Stallard's letter has excited my sympathy and understanding. The future of practice is indeed full of doubt for consultants returning from the Forces, particularly as living and consultant accommodation is almost unprocurable except perhaps at a prohibitive rent. This also applies to the Bayswater and Kensington areas as well as the area between Oxford Street and Marylebone Road, as I have discovered in many unproductive searches.

But I wish to point out that there is another service—the Emergency Medical Service—where senior full-time officers, some of them also on the honorary staff of teaching hospitals, did, on the outbreak of war, offer their services to the national call and in doing so terminated their civilian practices and left the West End, where they had lived and worked, and migrated to emergency hospitals in suburban and county areas. There they have been for nearly six years, doing what was asked of them and not permitted any contact with private work. Now they contemplate returning to their previous occupations, both hospital and private, and find it quite impossible to discover any form of living accommodation from which to restart. Speaking as one of these I hope our plight will be recognized equally with the doctors returning from the fighting Services. Most of us are in the sixth decade of life, our commitments are great, and time left to us to try and rehabilitate our fortunes is short.

I am in strong agreement with Major Stallard that some official effort should be made to requisition houses and flats quickly to make room for us who need to return in the imminent future. There is far too much accommodation occupied by offices and gentlemen of foreign extraction. It seems our claims—those of fighting Services and Emergency Medical Service alike—should come first and receive sympathetic and rapid attention.—I am, etc.,

ERIC A. SCOTT.

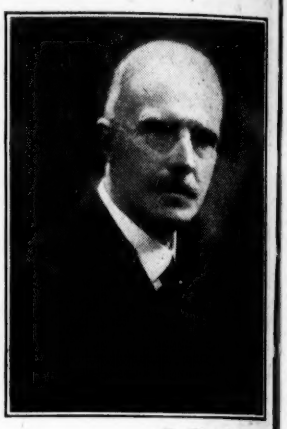
Orpington Emergency Hospital.

At the annual meeting of the Yorkshire Council of the British Empire Cancer Campaign, held in the Algernon Firth Institute of Pathology at Leeds, Sir Harold Mackintosh expressed from the chair the hope that they would soon be able to step up very considerably the range of their research work. Reports on the progress of research at Leeds University by Prof. R. D. Passey and at Sheffield University by Prof. H. N. Green were received. Mr. James Phillips suggested that there should also be co-operation with the Bradford Radium Institute, and the chairman said this would be given immediate consideration.

Obituary

N. BISHOP HARMAN, LL.D., F.R.C.S.

We have to announce with deep regret that Mr. Bishop Harman died at his home near Edenbridge on June 13 after a long and trying illness. The British Medical Association has always had the good fortune to enlist for its high offices men of outstanding personality and intellect, and among such men Bishop Harman stood out as one of the most many-sided and distinguished. He was treasurer for a far longer period than any previous holder of that office—from 1924 to 1939—but he did notable work for the Association in many other capacities—for example, as chairman of the Hospitals and later of the Ophthalmic Committees. In his own field of ophthalmology he had an international reputation; his books were widely read, and his counsel constantly sought by public bodies. He was, moreover, a man of culture and of philosophic bent, and something of an authority on many matters of art.



[*R. Elwin Neame*

Nathaniel Bishop Harman was born in London on St. George's Day, 1869. He was educated at the City of London School and after a few years in business went up to Cambridge, where he was Hutchinson research student and foundation scholar of St. John's College, and later demonstrator in the university school of anatomy. After training at the Middlesex Hospital he qualified in medicine in 1898, and took the F.R.C.S. in the same year. He served as a civil surgeon with the Field Force in the South African War, and received a medal and five clasps. Returning to London, he soon distinguished himself in ophthalmology. His work is well summarized in the illuminated address presented to him, with the Gold Medal of the B.M.A., in 1931:

"The list of your contributions to ophthalmological science and practice is a very long one, but your name is specially associated with the subjects of the prevention of blindness and the education of children with very defective sight. In both of these you are an acknowledged pioneer, and you have had the gratification of seeing the methods advocated by you adopted in many parts of the world. The practical results are seen not only in the compulsory notification of ophthalmia neonatorum, a measure which has led to a great reduction of blindness from this cause, and in the special classes in London for the education of children suffering from high myopia and other forms of defective sight, but in similar schools at home and abroad. This work has been recognized by many bodies interested in the prevention of blindness, both here and in other countries. The British Medical Association gladly places on record its appreciation of this good work inaugurated and carried out by you with characteristic enthusiasm. . . ."

It was his little book *Preventable Blindness* (1907), together with some Parliamentary lobbying, which was largely responsible for making ophthalmia neonatorum a notifiable disease, a measure which, owing to the care thereby made possible, did much to reduce the disease as a cause of blindness to very small proportions. In 1920–2 he served on the Departmental Committee charged with the study of the causes and prevention of blindness. The report of that committee was greatly influenced by the results of his work for the blind under the auspices of the London County Council, to whose education department he gave many years of service, latterly as ophthalmic consultant. As far back as 1908 in London he established a class for children with defective vision. Until that time children whose vision was faulty were taught in the ordinary classes, to the detriment both of their sight and of their educational progress. The "sight-saving classes" under the L.C.C. have now been copied all over the world, especially in the United States, and have been advocated in League of Nations reports. A revolution has been brought about in the methods of teaching and training short-sighted children. During the B.M.A. Meeting

at Winnipeg in 1930, when he was president of the Section of Ophthalmology, Bishop Harman found himself ranked as a celebrity because of his part in the introduction of these classes.

Among the posts he had filled were those of lecturer in ophthalmology at the West London Postgraduate College (where he was at one time dean), ophthalmic surgeon for many years to the West London Hospital and to the Belgrave Hospital for Children, and consultant to the National Institute for the Blind. His *Aids to Ophthalmology*, which has been translated into other languages, reached its eighth edition in 1935. *The Conjunctiva in Health and Disease* embodied the record of some research work and was published in 1905. *The Eyes of Our Children* was one of Methuen's Health Series, published in 1915, and in addition Bishop Harman contributed many articles on ophthalmology to this *Journal* and to special periodicals. One article in his characteristic style appeared in our Educational Number for 1924 and gave advice to those intending to specialize in ophthalmology, either exclusively or in addition to general practice, which may be still referred to with profit. Mention should also be made of his ingenuity in devising new instruments for the use of ophthalmic surgeons. Several widely used constructions bear his name.

Work for the B.M.A.

Bishop Harman joined the British Medical Association immediately on qualification. His early experience of active work in its behalf was in the Marylebone Division and the Metropolitan Counties Branch, and he served both Division and Branch as honorary secretary and treasurer, becoming eventually chairman of the Division, and in 1922–3 Branch president. He was a member of the Representative Body at its first meeting in 1903, but until the National Insurance Bill of 1911 his appearances there were occasional. In 1915 he became a member of the Council, and an arduous period of service began in that year, when, with Dr. Alfred Cox, he served as joint secretary of the Central Medical War Committee. This committee, which sat until 1919, had the delicate and onerous task of organizing the medical profession so that the Government could employ every doctor able to serve his country in such a manner as to turn his qualifications to the best use. Its register took the place, so far as the medical profession was concerned, of the general scheme of attestation for male citizens. The experience thus gained was of the utmost value in organizing medical manpower before and during the present war.

His next great piece of Association service was the framing of the first Hospital Policy. As chairman of the Hospitals Committee from 1920 to 1924 it was his hand that was chiefly felt in its initiation and advocacy. He described it as a thrilling experience to pilot the hospital policy through the Annual Representative Meetings. Others who remember the wearisome debates of those years may have a different impression, and the late Dr. Henry Wallace, who was Chairman of the Representative Body at the time, publicly described them as a nightmare. The debates were detailed and lengthy, and the policy was at first received with less than enthusiasm; but it is now recognized as a statesmanlike anticipation of the inevitable results of economic changes affecting the hospitals of the country.

In 1924 Bishop Harman was elected by the Annual Representative Meeting Treasurer of the Association, a post which made a strong appeal to him, and he expressed the hope that at the end of his "first" five years of office they would not be disappointed with "the man who held the bag." The five years extended to fifteen, and there was no disappointment. He became Treasurer just before the Association entered into possession of its property in Tavistock Square, though the cheque in payment of the house was signed by his predecessor, the late Dr. G. E. Haslip.

The removal from the Strand and the successive acquisitions and enlargements in Bloomsbury were a new phase of activity for the Association, and it was an immense advantage at such a time to have in charge of the purse a man who, with many other qualities, had been trained in business and could handle real estate and the realization of investments in stocks and shares with courage and foresight. During the same period the expanding membership and prestige of the Association were reflected in a balance-sheet of multiplying figures, on the debit as well as the credit side, and it was due to his careful husbanding of resources, and the masterly—often masterful—spirit in which he guarded the funds that a difficult, even a critical, time was passed through without any impairment of the essential work of the Association. In former years the finance of the Association was a favourite target for some critics in the Representative Body, but gradually they lapsed into silence, fascinated perhaps by the engaging presentation of the figures by the Treasurer, even if not quite convinced. As Treasurer also of the National Insurance Defence Trust Bishop Harman watched the stock markets with a shrewd eye, always investing to the best advantage the accumulating income.

For many years Bishop Harman was chairman of the Ophthalmic Committee of the B.M.A., and when later a Group of Practitioners of Ophthalmology was formed he was chairman of the Group Committee which took the place of the other body. He was always a doughty opponent of sight-testing by the medically unqualified optician. It was on his proposal that, in furtherance of the policy that the practice of sight-testing by other than qualified medical practitioners is not in the best interests of the public, approval was given in 1929 to the establishment of what is now known as the National Eye Service, which provides for persons insured under the National Health Insurance Act and others of like economic status an ophthalmic medical examination and any necessary glasses at fixed inclusive charges. He persuaded the Association to make a loan to the National Ophthalmic Treatment Board for organization and propaganda, and he had the satisfaction of reporting in due course the full repayment of the loan, which had enabled an excellent piece of work to be carried through. He took great pains over the periodical investigation and analysis of cases obtained for treatment through the medium of the Board as proving what a large proportion of cases in which persons complained of eye strain were due to something more serious than errors of refraction.

Bishop Harman was the nominee of the British Medical Association for the vacancy of direct representative on the General Medical Council caused by the death of Sir Jenner Verrall in 1929, and he was elected, obtaining nearly 12,000 votes. Later he became also a member, and treasurer, of the Dental Board.

In addition to his work on the Association's behalf he was a generous donor. In 1924 he presented the Treasurer's golf cup, which is competed for at Annual Meetings. In 1929 he presented the symbolic staff for use on all ceremonial occasions. The device is a serpent of silver above a shaft of English oak, with the initials "B.M.A." To this device he gave a great deal of thought. An artist himself of no small merit with the pencil, his knowledge of architectural decoration was of wide range, and no one in the Council spoke with more decision on such matters. The memorial gates of wrought iron in the courtyard of Tavistock Square owed much to his suggestions. In his generous attitude to the Association he was warmly supported by his wife, who in 1926 endowed the Katherine Bishop Harman Prize to be awarded by the Council for the encouragement of research into the disorders incident to maternity. Mrs. Bishop Harman, herself a medical woman, is a daughter of the late Arthur Chamberlain, of Birmingham, brother of Joseph Chamberlain.

A prominent member of the Unitarian body, Bishop Harman was elected in 1937–8 President of the General Assembly of Unitarian and Free Christian Churches. He often occupied the pulpits of his Church, and his addresses and articles on religious subjects were marked by the reflective habit of his mind and his skill in the simple illustrative exposition of what he saw as the truth. Whether his views commanded assent or not, he was always original and refreshing. A ready—almost too fluent—speaker, he was never a "big gun" on the platform, but he had a happy way with him which put his opponents in good humour even when it did not persuade them, and he was skilful in the use of kindly satire at which the victim laughed as much as any. Sometimes his eagerness in debate and his enjoyment of subtle juxtapositions led him into impulsive judgments and argumentative fallacies, and every now and then he seemed to be speaking with his tongue in his cheek. Perhaps his lightheartedness prevented some from appreciating to the full the solid work which he did and the deep seriousness which lay behind that gay exterior. He will be long remembered as a public-spirited man of great versatility and charm, a cheerful philosopher, and the best of friends.

HENRY R. KENWOOD, C.M.G., M.B., D.P.H.

We regret to announce the death in retirement on June 7 of Dr. H. R. Kenwood, emeritus professor of hygiene and public health in the University of London, and honorary lieut.-colonel, R.A.M.C. He was for some time a member of the Army Hygiene Consultative Committee and civilian member of the Army Medical Advisory Board.

Henry Richard Kenwood was born at Bexhill on Dec. 22, 1862, younger son of John Kenwood, of Wadhurst, and was educated at Tunbridge Wells, in Paris, and at the University of Edinburgh, where he graduated M.B., C.M. in 1887. After taking the D.P.H. he was for ten years M.O.H. for the Finchley District, and during part of that time deputy M.O.H. for St. George's, Hanover Square. From 1894 he was also M.O.H. and public analyst for the metropolitan borough of Stoke Newington, and from 1908 M.O.H. for the County of Bedford. Apart from his administrative duties Kenwood had been demonstrator and assistant to the Professor of Hygiene at University College from 1890 to 1904, when he became Chadwick Professor of Hygiene in the University of London. He was created C.M.G. in 1918 for his services to the Army during the last war, and the Royal Society of Edinburgh elected him a Fellow. He gave the Milroy Lectures on State Medicine and Public Health before the Royal College of Physicians of London in 1918, and held office later as president of the Society of Medical Officers of Health and chairman of council of the Royal Sanitary Institute; he was also an Honorary Foreign Member of the Société Française d'Hygiène. When he retired from his post in Stoke Newington after 33 years' service he was entertained by the members and officers of the council at a complimentary dinner and received an illuminated address.

Kenwood's name is well known in the profession through the textbook *Hygiene and Public Health*, written originally by Dr. Louis C. Parkes, and through his own manual, *Public Health Laboratory Work (Chemistry)*, which reached its eighth edition in 1925. "Parkes and Kenwood" appeared in an eighth edition in 1929 as "Kenwood and Kerr" to mark Prof. Harold Kerr's joint responsibility for much of the revision. Prof. Kenwood had also published papers on natural purification of sewage, sewage pollution of sea water, rural water supplies, and camp sanitation, and on tinned and potted foods. He joined the B.M.A. in 1888, was honorary secretary of the Section of Public Medicine at Portsmouth in 1899, and vice-president of the Section of State Medicine at Exeter in 1907; he had also served on one or two special committees at headquarters, and for a long period helped this *Journal* by revising the section on Public Health in the Annual Educational Number.

The Services

The Order of Polonia Restituta, Second Class, has been conferred by the President of Poland on Air Marshal Sir Harold Whittingham, K.C.B., K.B.E., K.H.P., Director-General of Medical Services, R.A.F., and that of the Third Class on Gp. Capt. Sir Louis Greig, K.B.E., C.V.O., M.B., R.A.F., in recognition of valuable services rendered in connexion with the war.

The Efficiency Decoration has been conferred upon the following officers of the Territorial Army: Majors (Temp. Lieut.-Cols.) W. W. Crawford and A. R. C. Higham; Majors H. S. Kent and P. Weiner; Capt. (Temp. Major) P. Brookes, R.A.M.C.

Repatriated.—Capt. Samuel Lask, R.A.M.C.

CASUALTIES IN THE MEDICAL SERVICES

Squad. Ldr. HAROLD BERNARD HUNT, who died on June 10, was born on Sept. 14, 1911, and studied medicine at Birmingham University, qualifying M.B., Ch.B. in 1935. He proceeded M.D. in 1937 and M.R.C.P. in 1938. Medical posts at hospitals under various authorities, including the L.C.C., were held by him until his appointment to a commission in the Medical Branch of the R.A.F.V.R. on Feb. 27, 1940. At the time of his death he was serving at a group headquarters in South-East Asia.

Died.—Major Arthur Waymouth, R.A.M.C.

Killed.—Temp. Surg. Lieut. A. McC. Vaughan, R.C.N.V.R.

Killed in motor accident in Italy.—Major David Watson Whyte, S.A.M.C.

Medical Notes in Parliament

HEALTH NOW AND IN THE FUTURE

When presenting the survey of the health of the nation on June 12 Mr. WILLINK said that to discuss the proposals for a National Health Service would be out of order that day. He could, however, say that the discussions promised in the White Paper of 1944 had proceeded actively, and in so far as they related to matters requiring legislation were now largely completed. In these discussions there had been no question of any departure from the fundamental objects of the comprehensive service proposed in the White Paper, and no question of diminishing the fullness of its range or of departing from the principle of its universal availability. The discussions had been concerned with methods and with questions of the administrative structure. To describe this discussion would be out of order, but it had confirmed him in the belief that it would be possible to give effect to the scheme foreshadowed in the White Paper in a manner which would command the general agreement of those upon whose work it would depend.

Mr. Willink then gave the House a broad survey of the nation's health during the war years. It was, he said, an astonishing story when one considered how much the civil population had had to endure in the last five and a half years. The health services had had to operate under heavy handicaps. About a fifth of the medical officers of the public health services had gone into the Forces, and almost one-third of the general practitioners—the first line of defence in the health services. Public health institutions—including sanatoria, fever hospitals, and hospitals for the chronic sick—had been hard pressed, with serious shortages of nursing and domestic staff. He paid tribute to the general practitioner, who had to struggle along doing two men's work and carrying many extra burdens, such as the giving of certificates for priorities, which were inevitable under war conditions. The general practitioners had been among the most overworked men on the home front, and the country owed them a debt of gratitude.

England and Wales had had no serious epidemic. In six winters they had only one influenza outbreak, and that was shorter and less severe than the kind we had before the war. The incidence of cerebrospinal meningitis rose sharply in the early part of the war, but gradually came down again. Typhoid fever had been less prevalent than in any peacetime year, in spite of the damage by bombs to water and sewage mains, thanks to the skill of the water engineers. Generally, infectious diseases had not been so prevalent as in normal times, but there had been a marked increase in infective jaundice. The birth rate had been rising since 1941, and last year was the highest since 1925. The effective reproduction rate for 1944 was provisionally assessed at 0.990—within 1% of a full replacement standard. This was the first time such a figure had been reached since 1922. Fewer babies had died. Fewer mothers were being lost in childbirth. The chance of a baby being born dead was three-quarters of what it was six years ago. The health of the children of this country—including the school-children—had improved. The infant mortality rate last year was 46 per 1,000 births, compared with the previous peacetime low record of 50.6 in 1939.

A LESS EASY SITUATION

For adults, the situation was less easy to assess, yet there was no evidence that they suffered to any appreciable extent. There had been an increase in tiredness and minor ill-health—the lesser ailments (from the doctor's point of view if not always the patient's). Most people were tired. They went sick more easily and recovered less quickly. Nevertheless, serious troubles had been no more prevalent and deaths from many kinds of disease declined during the war. Civilians of all ages were living as long as they did in peacetime. That calculation included deaths as a result of air raids. The Government's food policy had been one of the main factors in the maintenance of health standards. They had developed public education in matters of health, and extended the application of rehabilitation techniques in order to speed recovery and reduce disablement. They had organized a blood transfusion service which saved thousands of lives in war and could save many more every year in peace. As a result of experience with the Emergency Hospital Scheme, they knew that hospitals of all types could work together for the common good, with good will and splendid results. Mortality figures for the first quarter of this year did not maintain the improvement recorded in previous years. There was a slight setback in the infant and general mortality rates. Vigilance must be increased, and everything possible done, as quickly as resources became available, to improve the conditions which bore upon the people's health and strengthened the organization for dealing with ill-health. They

could not be satisfied with favourable vital statistics. They were already trying to find out more about the extent and nature of the incidence of other forms of ill-health, particularly minor ill-health. These lesser ailments, chronic though they might be, were not shown in the records, which covered only a limited number of illnesses; and in many cases they did not come under a doctor's care. There was a slight decline in venereal diseases last year compared with the previous year, for the first time since the war. New cases were still more than double the pre-war figure. They maintained the education campaign which was started more than two years ago, and which continued to receive the approval of the majority of the public. The number of deaths from tuberculosis last year was practically the same as the pre-war low record set up in 1938. There was, however, a substantial increase in notifications of new cases compared with before the war. The problem was to provide accommodation speedily for all those who needed sanatorium treatment. They had the beds, but could not get enough nursing and domestic staff.

The Minister of Labour's problem had all along been to get nurses and domestic workers for the sanatoria at a time when other urgent needs might seem to women and girls to have stronger claims on their services. There was a shortage of nurses before the war; and during the war, in spite of the substantial addition to the total number, the demand for them had steadily increased, and it had become more difficult to maintain essential services. The end of the European war would mean the disbandment of certain services employing nurses—such as the first-aid posts—and the reduction of others. On the other hand, married nurses and others with domestic responsibilities might now be unable to continue to nurse. There was an urgent need for more nurses so that hours could be reduced. In certain services—particularly tuberculosis, mental hospitals, chronic sick hospitals, and certain emergency hospitals—the staffing position had been especially difficult. There was a shortage also of midwives. The majority of these were recruited from the ranks of the State-registered nurse, and the rising birth rate increased the demand for midwives. Every effort had been made to post nurses to services where they were most needed, including a requirement that newly qualified State-registered nurses must serve for a year in one of the fields where there was a special shortage. The need for nurses would increase.

Deaths from Diphtheria and from Bombs

The diphtheria immunization campaign had been most successful, though much still remained to be done. New low records of both cases and deaths had been established in each successive year since the campaign began in 1941. The number of deaths last year was less than one-third of the pre-war average, and the number of cases just over half. For every three children who died before the immunization campaign started, only one died to-day. Cases notified last year numbered 28,000 below the pre-war average and 12,000 fewer than the previous low record. This progress was more remarkable in view of the severe diphtheria epidemics throughout Europe during the war years. He had asked all local authorities to make a special effort this year to increase immunization. Local authorities, doctors, teachers, nurses, and health visitors, and the W.V.S. and Red Cross and St. John Organizations were helping in persuading parents to give their children this protection. During the war more children had been killed by diphtheria than by bombs; the figures were just under 9,000 deaths from diphtheria and about 8,000 as a result of air raids. If the majority of children under 15 years of age were immunized instead of just over half as at present, and if every baby was protected as a matter of course at 1 year old, they could get rid of diphtheria as an epidemic disease.

Doctors throughout the country had been on the look-out for possible typhus cases since 1942, when the disease began to be prevalent in various parts of the Continent and in North Africa. A special warning was then sent to medical officers of health and was recently renewed. In 1942 his Department formed a special panel of consultants with experience of typhus. The services of these consultants were available to assist in diagnosis in all parts of the country. Throughout the war medical officers at ports and air ports kept watch to prevent the entry of suspected cases. Medical officers of health maintained supervision of those newly arrived in the country who were notified to them by the port officers as possible contacts. Twenty-one cases of typhus had been diagnosed in this country: fourteen were in prisoners of war repatriated from Germany; seven in medical students who were among the 100 volunteers for special duty in the Belsen concentration camp. All these cases were promptly isolated and no secondary cases occurred. All the medical students were now out of danger. Apart from these imported cases, there had been no case of louse-borne typhus in this country.

More than 11,000 patients in E.M.S. hospitals were taking daily courses of remedial exercises. In addition, 20,000 attended hospital daily for special exercises and remedial games. Of these 31,000 receiving rehabilitation, 15,000 took part in some form of occupational therapy. Hospitals providing rehabilitation for their patients had increased to 300. The majority of Service sick and wounded received their medical rehabilitation in E.M.S. hospitals. More than 250 doctors had been specially trained. A great deal of work would have to be done by the hospitals in connexion with the rehabilitation of men and women registered under the Disabled Persons (Employment) Act. The success of rehabilitation methods was likely to lead to an increased demand which hospitals throughout the country were getting ready to meet. The Ministry of Health would retain its rehabilitation department. There had been a significant development during the war in health education. Health rather than disease was becoming news. There had been an increased demand for health educational films for showing in factory canteens and to audiences in the rural areas. They could not progress towards a healthier Britain without the backing of sound, instructed public opinion, and a wider and deeper knowledge of the proper care of personal health, nd particularly the care of children.

D-Day Plans and Services

Speaking of the part which the Emergency Hospital Scheme took in the treatment of wounded men from North-West Europe, Mr. Willink said his Department undertook responsibility for all British Army casualties on arrival in this country. For the first time in our history provision had to be made to receive casualties in England direct from the beach and the battlefield until the Army could set up hospitals in Normandy. A few hours before the invasion nearly 1,000 doctors, nurses, and students were moved with secrecy from London to the coastal hospitals. The scheme worked smoothly. Between D-Day and VE-Day the number of casualties from North-West Europe passing through E.M.S. hospitals was 160,000. Side by side with their military responsibilities the hospitals in Greater London and the South-East treated more than 20,000 flying-bomb casualties. Many of the hospitals were damaged by bombs. Doctors, nurses, and all members of hospital and ambulance train staffs could be proud of their share in this campaign. The original arrangements included the provision of three different types of hospitals. There were, first, coastal or port hospitals at or close to the ports of disembarkation for the reception of patients unfit to travel: these contained over 1,200 beds. The second type consisted of transit hospitals, corresponding in function to casualty clearing stations, reached from the ports by road or by a short railway journey; these contained over 7,300 beds. There were, finally, home base hospitals in which patients were retained and treated to a conclusion. Home base hospitals consisted of the larger and more important hospitals in England, Wales, and Scotland, to which casualties were taken by ambulance train from the transit hospitals. A large number of beds were available in home base hospitals for the purpose, because some weeks before D-Day admission of ordinary civilian patients had been restricted to those in need of immediate treatment. Provision was also made from the start for the reception and distribution of air-borne casualties to three aerodromes in the neighbourhood of Swindon. The general scheme for the reception and treatment of these was similar to that for sea-borne casualties, with hospitals corresponding to port hospitals for those unfit to travel. The remainder of the casualties were transported to home base hospitals direct by train, no intermediate use being made of transit hospitals as casualty clearing stations. With the collapse of Germany Service patients of another kind came under the care of the E.M.S.—liberated British prisoners of war, together with numbers of civilians released from enemy hands. Most of them were evacuated from the Continent in the same way as battle casualties, but many were sent to hospital from the reception camps, where they were found to be in need of hospital treatment. Special forms of care were needed owing to malnutrition and other results of prison life.

Never before had the voluntary and municipal hospitals been welded together into an organic whole, working together under the regional and central direction of medical officers of the Government while preserving the internal autonomy of each hospital and the clinical freedom of the medical staff. Never before had the leading medical and surgical specialists placed themselves at the disposal of an organized medical service, and, by their dispersal up and down the hospitals of the country, spread their special knowledge among the medical profession as a whole to the benefit of the civilian population in general. Never before had it been possible on a national scale to separate out the patients requiring special treatment for special conditions—head injuries, facial injuries and burns, neuroses,

and so on—and to send them to centres set apart for them, where the most skilled staff and the best equipment were available.

THE DEBATE

Mr. JAMES GRIFFITHS spoke of sanatorium and hospital treatment in Wales. The Welsh National Memorial Association was concerned about the plight of Service and ex-Service men: there were some 450 of these occupying beds in the association's sanatoria and 157 others were on the waiting-list. In South Wales there were 2,000 persons waiting to go before the medical board for certification of silicosis. Of the negotiations on the White Paper he said it was clear that there had been fundamental departures from the principles of that Paper. This was not negotiation: it was capitulation; the Minister had given in to the B.M.A.

Mr. WILLINK intervened to say that he had engaged in discussions but had not sought binding agreements. It was for Parliament to decide what the form of the service should be.

Mr. GRIFFITHS said there had been a betrayal of the House. The B.M.A., in a circular to its members, "welcomed certain fundamental changes in the Government's proposals." The Minister had submitted to those who met him proposals fundamentally different from the scheme already submitted to the House. Was the Government promising one thing in its manifesto to the country and another to the B.M.A.? Did the present Government stand by the White Paper submitted by the last Government? Was it true that fundamentally different proposals had been submitted to the B.M.A. with an assurance that if the members accepted them the Ministry of Health would press them on the Government? Those proposals meant that there would be no comprehensive National Health Service, but only a botched-up panel system.

Sir JOHN BOYD ORR said that during the war, in spite of the scarcity of food, while the wealthy classes had got less than before they had not suffered in health; and the diet of the poorer classes had been levelled up. Increased consumption of protective foods and the change from white bread to bread with 85% extraction flour had led to a great improvement in the health value of the diet. Proteins, calcium, phosphorus, iron, and all the vitamins, with the possible exception of vitamin C, had increased in the diet of the working class from 10% to 40%. It would take some years before all the results were worked out, but there had been a definite improvement in the health and physique of the working classes. The infant mortality rate was also influenced by the feeding. If the level of housing and of feeding were brought up to well-known health standards and there was a sense of social security, more than 50% of the disease which afflicted the working classes could be prevented. Ten years would be added to the expectation of life of children born in those classes.

HEALTH SERVICE NEGOTIATIONS

Dr. EDITH SUMMERSKILL referred to "the document which had been circulated in the country embodying the proposals made by Mr. Willink to the B.M.A." She asked the Minister whether he had agreed to drop the introduction of health centres throughout the country. She understood they were to be dropped, although a majority of doctors in reply to the questionary from the B.M.A. had supported them. It was clear that the Minister and his friends were not happy at having this betrayal ventilated before the election. She had hoped that in the health centres the general practitioners would come together and would gradually achieve a much higher standard of medical practice. Now the Minister suggested that the general practitioner should remain isolated. The White Paper had suggested that voluntary hospitals and the municipal hospitals should be administered by one board. That had gone; the voluntary hospitals and their associations were to remain. The new proposals were designed to give the cottage hospital a new life while continuing to deny it adequate staff. The general practitioner would still be allowed to undertake major operations. The White Paper proposed that newly qualified doctors should be sent to practise in parts of the country where there was a dearth of doctors.

Mr. WILLINK intervened to say that the White Paper did not propose a power to direct a young doctor anywhere.

Dr. SUMMERSKILL said the Minister's alternative which was put to the B.M.A. read: "The proposed requirement that all doctors proposing to enter practice in new areas must obtain the Board's consent would be dropped." This meant in effect that the privileged would be assured of medical treatment while the worker might have to sit for an hour or two in a surgery before he received attention. To-day one-third of the doctors of the country were in the Services. What was to happen to the young doctor when he returned? The only freedom the Minister was giving him was freedom to go to the moneylender when he came back from the Services.

Mr. STOREY said Mr. Griffiths and Dr. Summerskill had made an unfair attack. The Minister had not dropped proposals which had been approved by the House. The discussions with the B.M.A., the B.H.A., and the local authorities were on alternative proposals which the Minister said he would put before his colleagues only if they were agreed by the bodies concerned.

Dr. MORGAN said he was a member of the Council of the B.M.A. and was astonished at the antimedical feeling in some quarters because the recognized organization of the doctors had desired to negotiate with the Government and with other bodies to discuss the conditions of their work in future. It was no secret that the B.M.A. had entered into discussions with the Trade Union Congress. As a result of the Llanelly medical dispute a joint committee was formed between the B.M.A. and the T.U.C. which discussed problems interesting to both. He himself had objected to certain terms of the White Paper which he thought involved the directing of young doctors. The Minister had given him personal assurance that it was not the intention of the Government to direct doctors into particular areas. What principles had been broken in the discussions? Uniformity was still there, availability was still there, necessity for the fully trained competence of the doctor was still there, adequate planning was still there, prevention was still there. Unfortunately in regard to the administrative structure the Minister had allowed the medical profession to put forward proposals which would give the profession a majority in most of the bodies. The consultants in voluntary hospitals had seen to it that they got a big share in any proposed administrative system. He thought, however, that if negotiations were allowed to continue things would right themselves.

Mr. WILLINK said the projected Bill was not, as had been hoped, being introduced in the course of this Parliament. It would be introduced in the new Parliament. No Government constituted as the present one would in any way limit the availability of the proposed service or its comprehensive character, nor would they fail in achieving any of the objectives of the White Paper. It was not for the Government to square its declaration of policy with a document issued by the B.M.A. The declaration of policy would be found in the Prime Minister's declaration issued the previous day. No agreements of any kind had been made with the bodies which undertook the discussions.

Dr. HADEN GUEST suggested that if the medical men in the Services had not been adequately consulted special steps ought to be taken to do so. A large number of the doctors serving in the Army strongly favoured the White Paper in its original form with some modification in the direction of more fully representing the State medical service proposals. The doctors in the Services deserved special attention because much more progress had been made in medicine and in surgery in the Army than in civil life. If doctors were to have to buy their practices in the future what was to become of the recommendation of the Goodenough report that a larger proportion of doctors should be recruited from the working classes? At present only 6% of the doctors came from those classes.

Dr. RUSSELL THOMAS said it had become clearer to hospitals, the medical profession, the public, and probably to the Minister and the Government that the principles of the White Paper could not be enforced because the public would not swallow the bringing into office of the types of officials envisaged.

Nursing and Tuberculosis

Mr. SORENSEN asked on May 31 about the conditions of nurses in tuberculosis sanatoria.

Mr. WILLINK said that with the Minister of Labour and National Service he had under consideration the conditions in a number of sanatoria. Many were satisfactory; others had defects that could be remedied only by building that could not at present be undertaken. Others were in isolated situations so that the provision of certain amenities was difficult. Such steps as were practicable in present circumstances were being taken to remedy these defects. There was no prescribed minimum age either for tuberculosis nursing or for other types of nursing. It was preferable that girls undertaking nursing should not be under 18. The Athlone Committee, which reported in 1938, considered that 17 should be the minimum age. Statistics on the incidence of tuberculosis among sanatorium nurses were not available. The general opinion of experts was that the sanatorium nurse was at no greater risk than other nurses. An inquiry was in progress under the Joint Tuberculosis Council. Mr. Willink added that in March, 1944, he had issued a circular on precautions advised to safeguard nurses in hospitals.

Mr. SORENSEN said a number of medical experts, including medical officers of health, declared that younger nurses were more prone to catch this disease than were the older ones. Mr. WILLINK said the inquiry would take account of that.

Tuberculosis Waiting Lists

Mr. HAMMERSLEY asked on May 31 whether steps could be taken to deal with the tuberculosis patients in Middlesex whose treatment was delayed owing to insufficient hospital accommodation. Mr. WILLINK answered that this problem, which was not confined to Middlesex, received his constant attention. He was taking all possible steps, in collaboration with the Minister of Labour and National Service, to ease the situation, but great difficulties were caused by the present demands on building labour and material and the dearth of nursing and domestic staff. He could not promise that the amelioration would be rapid. He would look into the possibility of using hospitals which the Americans had evacuated and had turned over to British military authorities.

Malaria and Quinine Supplies

Mr. AMERY said on May 31 that it was not possible to give reliable figures of deaths in India specifically attributable to malaria nor to estimate to what extent they might have been reduced by greater use of quinine. The supply of quinine until the Japanese occupation of Java was broadly equal to the demand. Supplies of synthetic substitutes had for some time been reaching India in substantial quantities. Of the 244,000 lb. of quinine in stock in April, 1944, 200,000 lb. was available for civilian consumption.

Medical Man-power and the Education Act

Mr. STOREY on June 7 asked the Minister of Education whether he was aware of the difficulty of local education authorities, owing to the shortage of doctors and nurses, in carrying out the duties imposed on them by Section 48 (3) of the Education Act, and what steps he proposed to prevent authorities from throwing further burdens upon the depleted medical personnel of the country.

Mr. RICHARD LAW in reply said he was aware of the shortage of doctors, dentists, and nurses and of the strain under which they were working. In Circular 29 authorities had been asked to extend their arrangements with hospitals so as to secure free hospital treatment for all children attending maintained schools, so far as accommodation and staffing conditions allowed, and to develop those clinic services which had always been recognized as appropriate to the school medical service. The needs of urban areas generally would be met in this way. The position in rural areas was more difficult, and the circular suggested that authorities should arrange for the treatment of children where necessary by local general practitioners. Such arrangements could be made only on a limited scale, but it was hoped that here and there doctors would be found who were willing to undertake this work in a part-time capacity under arrangements made by the authorities and approved by his Department. An assurance was given in the House during the third reading of the Education Bill that the development of the school medical service would not be inconsistent with, or duplicate provision to be made by, the National Health Service of the future. He would not approve any proposals leading to the setting up by local education authorities of a general medical practitioner service. The Act had been passed and its provision must, so far as practicable, be implemented. The service which could be provided in the next year or so must be limited to the extent necessary to comply with the undertaking given about its relationship with the future National Health Service. The scope of the service must also be restricted owing to the shortage of medical man-power.

Sheffield Silicosis Board's Work.—The Sheffield Panel of the Silicosis Medical Board, under all the compensation schemes for pneumoconiosis, including silicosis and asbestosis, dealt in the year 1944 with 298 applications and granted 112 certificates. In 1943 the comparable figures were 159 and 51; in 1942, 74 and 19.

Refusal of Drugs in the Army.—Mr. VIANT on May 29 asked whether officers or other ranks, who had a strong objection to taking drugs such as mepacrine, had a right to refuse. Sir JAMES GRIGG said they had not. Officers and other ranks had no right to refuse to obey a lawful order. Commanders-in-Chief were entitled to issue orders to ensure that their troops were fighting fit and kept free from disease. Neither religious scruples, however bona fide, nor dislike of unpleasant after-effects, afforded justification for refusing to take mepacrine.

Harley Street Houses.—Mr. CHURCHILL told Sir Ernest Graham-Little on May 31 that the majority of the houses requisitioned in the Harley Street area by Government Departments were used to house American officers, as offices for French missions and branches of the French Embassy, or as hostels. The possibility of reducing the number retained was being examined with occupying authorities. Any houses which could be vacated would be released. Five requisitioned houses now vacant were being released immediately. Sir ERNEST in his question reported that 56 houses in the area continued to be requisitioned. He said evidence had been submitted to Mr. Churchill of a shortage in this area of houses for medical consultants.

Universities and Colleges

UNIVERSITY OF CAMBRIDGE

The Registrary has given preliminary notice that Monday, June 25, will be nomination day for the University Parliamentary Election. Polling days for ordinary electors and for all proxy voters will be from Thursday, July 5, to Tuesday, July 10 inclusive (but not on Sunday, July 8). Service postal votes may be received not later than July 29. The count will begin on July 30 and the result be declared by July 31.

At a Congregation held on June 8 the following medical degrees were conferred by proxy:

M.B., B.CHIR.—R. D. Hearn, J. M. Davis.

UNIVERSITY OF SHEFFIELD

The University Council on June 8 received with regret the resignation of Mr. Vincent Townrow, F.R.C.S., of the post of lecturer in diseases of the ear and accorded him its thanks for his services to the University. G. L. Hermitte, M.B., Ch.B., was appointed temporary demonstrator in anatomy.

ROYAL FACULTY OF PHYSICIANS AND SURGEONS OF GLASGOW

At a meeting of the Royal Faculty of Physicians and Surgeons of Glasgow held on June 4, with Mr. Wm. A. Sewell, President, in the chair, Sir Alfred Edward Webb-Johnson, Bt., K.C.V.O., C.B.E., D.S.O., President of the Royal College of Surgeons of England, was admitted an Honorary Fellow.

Medical News

During his recent tour in Sweden to lecture on penicillin, under the auspices of the British Council and at the invitation of the Swedish Medical Society, Sir Howard Florey, F.R.S., was honoured with the presentation of the Berzelius Medal in Silver. This medal was presented to members of the Swedish Royal Family and certain other distinguished persons when it was instituted in 1850. It had not been awarded since that time.

The annual general meeting of the Paddington Medical Society will be held at the Paddington Tuberculosis Dispensary, 14, Newton Road, W., on Tuesday, June 26, at 9 p.m., when the president, Dr. Z. Green, will speak on "War Experiences in General Practice."

The next science meeting of the Physical Society will be held at 5 p.m. on Friday, June 29, at the Royal Institution, Albemarle Street, when the 14th Thomas Young Oration will be delivered by Prof. Ragnar Granit, of the Nobel Institute for Neurophysiology, Stockholm, his subject being "The Electrophysiological Analysis of the Fundamental Problem of Colour Reception."

The following sessional meetings of the Royal Sanitary Institute are announced: Saturday, June 30, 10.15 a.m., at Sunderland Town Hall, papers on "The Water Supply in the County of Durham" by Messrs. A. B. E. Blackburn, J. A. Rodwell, and W. G. Carey; Saturday, July 7, at 10.15 a.m., at Banbury Town Hall, papers by Prof. G. Selby Wilson, "Bacterial Food Poisoning," and by Mr. J. Campbell Riddell, "Survey of Sewage Treatment and Sewage Treatment Works Design."

A meeting of the Medical Society of the L.C.C. Service will be held at St. Andrew's Hospital, Devons Road, Bow, E., on Thursday, July 5, at 3 p.m., when members of the staffs of Mile End, St. George-in-the-East, and St. Andrew's Hospitals will demonstrate cases.

The Trustees of the Lady Tata Memorial Fund announce that, on the recommendation of the Scientific Advisory Committee, they have agreed to make the following awards for research in blood diseases, with special reference to leukaemia, in the academic year beginning Oct. 1, 1945. *Grants for Research Expenses:* Dr. P. A. Gorer (London), Dr. A. H. T. Robb-Smith (Oxford). *Personal Grant:* Dr. Penelope K. Hammick (Oxford). *Part-time Personal Grant and Grant for Research Expenses:* Dr. W. Jacobson (Cambridge). Since these awards do not fully use the margin of funds available, it is hoped to issue a public advertisement for new candidates from the continent of Europe and elsewhere as soon as conditions permit.

Major R. Scott Stevenson, M.D., F.R.C.S.Ed., has been adopted as Liberal National candidate for Western Fife at the General Election.

A party of scientists left England on June 14 for Russia to attend the celebration of the 220th anniversary of the founding of the Academy of Sciences of the U.S.S.R. The medical members were Prof. E. D. Adrian, O.M., F.R.S. (who represented the University of Cambridge) and Prof. Arnold Sorsby, F.R.C.S. (representing the Anglo-Soviet Medical Council). The party arrived in Moscow on June 15.

No. 22

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended June 2.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1945 (a)	(b)	(c)	(d)	(e)	1944 (Corresponding Week) (a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	44	9	22	2	—	71	3	32	—	3
Deaths		3	—				2	1		
Diphtheria	436	20	106	108	18	471	21	124	53	21
Deaths	11	—	3	1	—	10	1	2	6	1
Dysentery	458	37	155	1	—	187	24	95	—	—
Deaths				—	—				—	—
Encephalitis lethargica, acute	2	—	—	—		2	—	1	—	—
Deaths		—					—			
Erysipelas			42	8			49	10	3	
Deaths		—				1				
Infective enteritis or diarrhoea under 2 years				35					10	
Deaths	50	8	11	15	2	45	5	13	10	5
Measles*	10,455	508	410	64	3	2,758	271	514	105	42
Deaths	2		—	—	—	1	1	1	—	—
Ophthalmia neonatorum	72	7	20	1	—	82	4	22	—	—
Deaths										
Paratyphoid fever	8	1	9 (B)	—	—	2	—	—	2 (B)	—
Deaths	—	—	—	—	—	—	—	—	—	—
Pneumonia, influenzal†	486	21	4	10	2	794	61	7	4	5
Deaths (from influenza)	5	—	—	—	—	14	2	—	—	—
Pneumonia, primary			184	19				284	24	
Deaths		23		14	7		34		6	5
Polio-encephalitis, acute	—	—				—	—			
Deaths		—					—			
Poliomyelitis, acute	3	—	—	—	—	4	1	5	—	—
Deaths		—					—			
Puerperal fever		2	6		—		2	20		—
Deaths										
Puerperal pyrexia‡	104	5	8	—	—	195	8	12	2	2
Deaths		—					—			
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	1,233	45	239	21	32	1,479	92	206	23	60
Deaths	2	—	—	—	—	1	1	—	—	—
Smallpox	—	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Typhoid fever	8	2	—	3	—	6	—	2	5	—
Deaths	—	—	—	—	1	—	—	—	—	—
Typhus fever	3	—	—	—	—	—	—	—	1	—
Deaths				—	—				—	—
Whooping-cough*	982	45	129	24	16	2,273	283	210	27	15
Deaths	4	—	1	—	—	23	6	2	—	—
Deaths (0–1 year)	329	48	47	42	21	345	45	61	27	24
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	4,019	566	526	211	128	4,190	617	590	195	127
Annual death rate (per 1,000 persons living)			11·9	13·6	§			13·6	12·6	§
Live births	7,043	727	925	451	260	6,754	832	956	486	309
Annual rate per 1,000 persons living			18·5	29·1	§			19·4	—	§
Stillbirths	253	31	29			231	26	36		
Rate per 1,000 total births (including stillborn)			30					36		

* Measles and whooping-cough are not notifiable in Scotland, and the returns are therefore an approximation only.

† Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

‡ Includes puerperal fever for England and Wales and Eire.

§ Owing to evacuation schemes and other movements of population, birth and death rates for Northern Ireland are no longer available.

EPIDEMIOLOGICAL NOTES

Discussion of Table

In *England and Wales* during the week the incidence of whooping-cough rose by 127 cases, that of dysentery by 84, and that of diphtheria by 40, while falls were recorded for measles and scarlet fever of 953 and 62 cases respectively.

Small increases in whooping-cough were recorded in many counties; the largest were Lancashire 29, and Yorks West Riding 27. The biggest increases in diphtheria were Kent 14, and Derbyshire 13. The trend of scarlet fever showed only small variations, the largest of which were a rise in Lancashire of 28, and a fall in Warwickshire of 29. The largest declines in measles were Yorks West Riding 245, Glamorganshire 166, Middlesex 139, Devonshire 110, London 106; and the chief exceptions to the general decline in incidence were rises in Monmouthshire 111, Essex 101, Hertfordshire 55.

The increase in dysentery was due to a large outbreak in Berkshire, where the cases rose from 8 to 106. The centre of infection was Windsor R.D. 75, and Easthampstead R.D. 27. Other large returns were Lancashire 50, London 37, Surrey 30, Middlesex 24, Kent 22, Essex 22, Yorks West Riding 16, Warwickshire 12, Shropshire 11, Bedfordshire 10, Gloucestershire 10.

In *Scotland* rises occurred in whooping-cough 53, dysentery 48, measles 25; while diphtheria decreased by 26. The increase in dysentery was mainly contributed by a rise in the city of Aberdeen from 13 to 30, and by an outbreak of 17 in Moray, Nairn County; other large returns were those of the cities of Glasgow 38, and Edinburgh 20.

In *Eire* a rise of 35 in diphtheria formed the chief feature of the returns; the disease is widespread and the 108 notifications involved 38 registration areas. Diarrhoea and enteritis remained at a high level in Dublin C.B., where 30 more cases were recorded during the week.

Week Ending June 9

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 1,409, whooping-cough 1,033, diphtheria 423, measles 8,463, acute pneumonia 427, cerebrospinal fever 52, dysentery 426, paratyphoid 4, typhoid 6. Two cases of typhus were imported.

Letters, Notes, and Answers

All communications with regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, LONDON, W.C.1. TELEPHONE: EUSTON 2111. TELEGRAMS: *Aitiology Westcent, London.* ORIGINAL ARTICLES AND LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone unless the contrary be stated.

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ANY QUESTIONS?

Pityriasis Versicolor

Q.—*A girl aged 24, in good general health, suffers from a rash on the trunk, inside of the thighs, the deltoid region, the front and lateral aspect of the arms, and the radial border of the forearm to the wrists. The buttocks, lateral sides of the thighs, axillae, triceps, and ulnar side of the forearms are normal. The rash is symmetrical and has a "jig-saw" edge. It was first noticed about twelve years ago, when the areas affected were mostly the back and shoulders. From here it spread gradually forward around the trunk until it has met along the midline on the abdomen and lower chest. The skin over the upper part of the chest and between the breasts is free except for small isolated patches. The rash is light brown and yellowish in colour over the upper part of the body and arms: over the abdomen it is darker. There is pityriasis capitis, and septic spots on chin and neck. There is a history of a similar but milder condition in the patient's father. What are the probable diagnosis and the most effective treatment?*

A.—The description suggests pityriasis versicolor. The diagnosis can be verified by examining scales for the causal fungus (*Microsporon furfur*). If this diagnosis is confirmed treatment with 3% benzoic and salicylic acid in vaseline should be effective, a portion of the eruption being treated at a time. Suitable disinfection of clothing prevents reinfection.

Fractures and Urinary Calculi

Q.—I have been impressed by the number of war casualties laid up with compound fractures that get calculi in the renal tract. What is the cause of this, and how may it be prevented?

A.—The special factors in the formation of recumbency urinary calculi are decalcification of bone and urinary stasis. Generalized decalcification has been explained on the basis of relative hyperaemia of bone, the result of muscular inactivity. In addition to this, with compound fractures large amounts of calcium may be mobilized locally through inflammatory hyperaemia. Thus the blood calcium is raised, leading in turn to a raised urinary calcium, a major factor in stone formation. Urinary stasis is the result of long-continued decubitus. It is obvious that in this position any solid particles must tend to be deposited in the renal calices and pelves, and to remain there, forming the nuclei of future stones; this effect will be increased when the foot of the bed is raised, as in the traction treatment of certain lower-limb fractures.

The most important general factors probably are an alkaline reaction and a high concentration of the urine. The commonest recumbency stone is composed chiefly of calcium phosphate, which is precipitated only in an alkaline urine. The reaction is influenced by diet and drugs and also by infection. High concentration is chiefly caused by low fluid intake, but prolonged exposure of the body to the hot sun may have the same effect through excessive perspiration. Among other aetiological factors may be mentioned vitamins A and D; there is a fair amount of evidence that excess of vitamin D or deficiency of vitamin A may cause stone formation.

Much can be done to prevent this complication, and the chief methods of prevention will be apparent from what has been said. Disuse decalcification can be minimized by encouraging active movements of the uninjured parts. To facilitate urinary drainage the patient's position should when possible be changed at regular intervals by turning him on to his side or into the prone position, and by raising the head-end of the bed on blocks. Plenty of fluids should be given and excessive exposure to the sun avoided. The urine, if alkaline, should be made acid by diet and possibly by drugs; the latter should rarely be necessary with an uninfected urine unless calculus is actually present. Finally, there is sufficient evidence to justify the use of vitamin A as a prophylactic, and the possible danger of vitamin D should be remembered.

Calcification and Cancer

Q.—Calcification is one method of cure in tuberculosis. Is there any reason to expect that if calcification could be induced in a cancer, delay or arrest of growth might occur? It is common in cerebral tumours which are slow-growing. I have seen it in a hypernephroma which "galloped" to its end.

A.—There seems to be no reason to expect a cure for cancer from calcification, a pathological process which often occurs when dead tissue is retained in the body. Presumably the tumour cells would have to be killed antecedent to the calcification, and if all the tumour cells were killed the cure would be complete before deposition of lime salts began. When tumours regress, as they often do in transplanted growths, calcification does not occur, and there is no substantial evidence warranting a belief that it would occur in human tumours which have been partly destroyed. Moreover, in meningiomas, in which calcium salts are so frequently deposited, cures are not observed as a consequence of the process. Of course cells may be involved and killed in calcification, but it is very unlikely that this common process can be started and controlled effectively and used to cure cancer. The trouble with cancer cells is their ability to grow and divide, not to die.

Inheritance of Epilepsy

Q.—Miss A. wishes to marry Mr. B. She learns that his mother died in an epileptic fit. Of Mr. B.'s brothers, one is mentally deficient, and the other is described as being abnormally moody. Mr. B. himself is described as mentally normal. Miss A. wishes to know her chances of producing normal children.

A.—The facts provided are insufficient to allow a precise answer to the question. Further points on which information would be desired are: (1) Was the mother an epileptic, or was the epileptic fit merely a terminal manifestation? (2) What degree of mental deficiency does the brother show, and of what clinical type is it—e.g., could it be due to birth injury or other external conditions? (3) If electro-encephalographic tests could be carried out, does the moody brother and does Mr. B. himself show cerebral dysrhythmia? (4) Is there any evidence of instability of any kind in Miss A.'s family, and is Miss A. herself perfectly normal?

If both Miss A. and Mr. B. are themselves perfectly normal and are over the age of 30 (by which time tendencies to instability might be expected to have shown themselves), the outlook for their children is quite good regardless of the bad family history on one side. If it can be fairly easily arranged it would be desirable for both to have an electro-encephalographic examination. The chance of epileptic or otherwise abnormal children is material if both, despite apparent normality, were to prove to have cerebral dysrhythmia.

Drugs causing Bronchodilatation

Q.—Is there any drug that may be successfully used to cause bronchodilatation without affecting the heart, and if so what is the dose, how often should it be used, and are there any contraindications in asthma?

A.—There is no drug which causes dilatation of the bronchioles without having some effect, however slight, on the heart at the same time. For practical purposes, the only useful drugs for causing bronchodilatation are adrenaline, ephedrine, and theophylline (or substances related to it). Adrenaline is well known to cause increased force and rate of heart-beat and is disagreeable to some patients for this reason. Ephedrine has a similar, though much less violent, action on the heart, and when used in the correct dose (which differs from one patient to another) should have very little cardiac effect. By reducing the rate at which the patient's own adrenaline is destroyed it maintains vasodilatation in the bronchioles. Theophylline with ethylene diamine, given intravenously, is found by some to be of value in the most severe asthmatic attacks which are not relieved by the injection of adrenaline. Theophylline causes a dilatation of the coronary vessels and slight augmentation of the force of the heart-beat, but this effect on the heart is rarely evident even to the patient.

Treatment of Smallpox

Q.—Have there been any recent advances in the treatment of smallpox? Is there any "serum" therapy such as convalescent serum or the serum of successfully vaccinated persons? Does penicillin materially affect the course of the disease apart from preventing secondary infection? What is the best treatment for the actual skin condition?

A.—The treatment of smallpox remains essentially symptomatic. Sulphonamides and penicillin probably exert an indirect influence by attacking the secondary invaders, but that is all. Convalescent smallpox serum was used over 20 years ago and subsequently discarded. However, recent methods of concentrating antibodies in human globulin appear to justify reassessment of the value of convalescent serum in the treatment of a number of diseases. Of the various local applications tried on the skin lesions, the one which has found most favour is a saturated solution of permanganate. This antiseptic inhibits the growth of the smallpox virus and appears of established value when applied early—i.e., in the papular stage.

Viability of Disease Organisms

Q.—What are the viabilities of the causal organisms discharged from the body during the course of the following communicable diseases under the conditions of temperature, moisture, etc. (but not antisepsis) to which they are exposed in the average sick-room? (a) Cerebrospinal fever; (b) diphtheria; (c) gonorrhoea; (d) syphilis; (e) pneumococcal pneumonia; (f) scarlet fever; (g) whooping-cough; (h) pulmonary tuberculosis; (i) non-pulmonary tuberculosis; (j) acute encephalitis lethargica; (k) measles; (l) influenza; (m) chicken-pox; (n) smallpox; (o) mumps; (p) poliomyelitis.

A.—The viability of pathogenic bacteria and viruses in natural discharges under the ordinary conditions of temperature, humidity, etc., in a sick-room or hospital ward is not easily determined, and will vary with dosage, degree of protection by mucus or dust, exposure to daylight, rate of drying, etc. However, it has been found that under such natural conditions pneumococci will remain viable for some days, and haemolytic streptococci and diphtheria bacilli for some weeks, in the dust of ward or sick-room. The tubercle bacillus is very susceptible to the bactericidal action of light—and daylight even through glass is bactericidal—so that exposure in a room for a few hours is lethal unless dosage is heavy. Tubercle bacilli in discharges from suppurative lesions of non-pulmonary tuberculosis will be similarly affected. The Gram-negative diplococci, meningococcus and gonococcus, and *Treponema pallidum* die within a few hours in drying secretions, but may remain alive for 24 hours or longer if the discharges remain moist. (*Treponema pallidum* from the serous exudate of a chancre has crossed the Atlantic 4 or 5 times in a sealed capillary tube and still remained motile.) Little is known about the viability of the pertussis bacillus, but the fact that the transmission of whooping-cough usually requires intimate contact suggests that the infecting organism is not very resistant to environmental influences.

Among the virus diseases listed, nothing seems to be known about the viability outside the body of the causative agents of measles, mumps, encephalitis, and chicken-pox. Influenza virus, after being atomized into the air in concentrated suspension, remains infective to mice for 6 hours in a relative humidity of 45 to 50%, and for longer periods in a drier atmosphere. The virus of smallpox seems to be particularly resistant to desiccation if we accept reports of infection being conveyed in bales of cotton from Egypt to this country. As regards poliomyelitis, there is considerable controversy as to how the infection is spread: it has not apparently been recovered from the environment of an infected case, but it is recoverable from the sewage effluent of a hospital where patients with poliomyelitis are being nursed.

Mirror-writing

Q.—*A healthy, intelligent, left-handed girl of 6½ indulges in mirror-writing. Is any treatment necessary, apart from education by her school teachers? She is the elder of two girls, and appears to be jealous of attentions paid to her sister (aged 2).*

A.—One would like to know whether the mirror-writing is carried out habitually or only on occasions. (It is assumed that the writing is being done with the left hand.) If the mirror-writing is merely an occasional event, then no action is called for. The phenomenon should be ignored and not encouraged.

Should, however, the mirror-writing be the regular practice, then two ways lie open: either to change over and use the right hand, or else to force the left hand to write in the proper fashion. This latter is none too easy, for mirror-writing represents the most natural way of writing with the left hand. To change from left-handed to right-handed penmanship is not very desirable, and the traditional belief that stammering is thereby produced is not altogether fallacious. On the whole, the most desirable procedure would be for the teacher to insist upon the child correcting its mirror tendencies, but continuing to use the left hand.

Xerostomia and Aptyalism

Q.—*A woman of 70 has suffered since the early raids on London from more or less complete absence of saliva. Her tongue is red and glazed and somewhat fissured, the tip at present having a painful crack. Mastication is difficult. Many people know how dry the mouth becomes during moments of fear, but that this woman's should have continued in this state is unusual. Is it likely to be a hysterical prolongation of a condition which had at first a physiological basis; or is the pathology perhaps due to something else entirely?*

A.—Little is known of the pathology of xerostomia and aptyalism. Dry mouth is sometimes associated with similar symptoms in other systems—keratoconjunctivitis sicca, achlorhydria, anaemia, arthritis, etc.: the so-called Sjögren's syndrome. The condition occurs characteristically in middle-aged and elderly females. The aetiology has been variously ascribed to neurosis, avitaminosis, and infection, but it seems unlikely to be a hysterical perpetuation of a fright reaction. No specific treatment is known, though removal of dental infection and the use of cod-liver oil have been recommended.

Flush Ligature for Varicose Veins

Q.—*In a woman of 30 both lower legs show small varicose veins which have been injected during the past five years with sodium morrhuate, quinine and urethane, etc. By annual attention the lower legs can be kept free but not cured. In both upper legs the saphenous vein shows up as a prominent straight vein running from the internal aspect of the knee and fading into the upper thigh. The characteristic tortuous appearance is not present except at the beginning at knee level. No cough impulse. Repeated injections have failed to cause thrombosis, and the patient is anxious to have the vein rendered invisible. Is there any method other than ligation at the groin which will do this?*

A.—This case would be best treated with a flush ligature in the groin so as to separate the saphenous vein and its inguinal tributaries from the femoral vein. A second ligature just above the knee would also help. At the time of the ligatures the distal vein when exposed in the wound should be injected with a sclerosing agent, and after two weeks' interval the remaining patent veins should be injected systematically. A long-standing cure should be obtained in this way, and the ligatures done under local analgesia with no recumbency afterwards are not a great inconvenience.

Hypomenorrhoea

Q.—*A married woman aged 35 has for the past two years suffered from hypomenorrhoea. Whereas the menstrual flow lasted four to five days, it now lasts one day only and is scanty. There has been no alteration in rhythm. The only other symptom is undue fatigability. This is not an isolated case in my experience, and I find that the women themselves attribute it to general anxiety engendered by the war. Is there a possible endocrinological basis, and is any treatment indicated?*

A.—Unlike the cause of menstruation, the factors which determine the amount and duration of the menstrual flow are largely unknown. Those possibly of importance are the strength of the hormone stimulus, the ability of the uterine tissues to respond to the stimulus, anatomical variations in the vascular system of the endometrium, the action of the muscles of the myometrium and the blood vessels, and the area of the bleeding surface (i.e., size of the uterus). Clinical experience goes to show, however, that scanty menstruation is often of little, if any, significance. On the other hand, hypomenorrhoea, like amenorrhoea, can result from any general disturbance or ill-health—including malnutrition, prolonged nervous strain, etc. The conditions created by the war might well be responsible for altering the character of the menstrual flow in some cases. The tendency to fatigue, however, is not likely to be due to the scanty menses, but rather to the same environmental causes. Although it is supposed that there is some depression of pituitary or ovarian function (arising either directly or indirectly via the hypothalamus) in these cases, there is no indication for replacement therapy with hormones. Treatment should be directed to the cause, and efforts made to ensure that the patient has a proper diet, adequate rest and leisure, freedom from anxieties, and change from the daily routine.

Kahn Verification Test

Q.—*I have read your two notes on the positive Kahn in yaws (JOURNAL, March 31, p. 469, and April 14, p. 543). What is the Kahn verification test? Does it enable one to distinguish between the true and false positive serological reactions for syphilis? Does it enable one to distinguish between syphilis, yaws, and other conditions that give the so-called "false positive"? Please give either details of the technique of the Kahn verification test or else references.*

A.—The Kahn verification test is not a diagnostic test but a supplementary test. If the diagnostic test is positive the verification test is supposed to indicate whether the positive reaction is associated with syphilis or not. While this may be the case where false positive Kahn reactions are encountered in such conditions as malaria, leprosy, or typhus, it seems unlikely to hold in the case of such a closely similar condition to syphilis as yaws, although information on this matter is scanty. There is considerable literature on the Kahn verification dating from 1940, as follows:

Verification Test	Journal	Vol.	Page	Year
Verification test in syphilis	*O Hospitcl*, Rio de Janeiro	24	813	1943
*Verification test in serology of syphilis	*J. Lab. clin. Med.*	28	1175	1943
Verification test—prelim. note	*Edinb. med. J.*	50	344	1943
Verification test in malaria (differential diagnosis of syphilis)	*J. Lab. clin. Med.*	28	882	1943
Use of quantitative test in verification procedures	*Amer. J. Syph.*	26	629	1942
Verification test. Appraisal based on clinical and serological evidence	*Arch. Derm. Syph.*, Chicago	44	1031	1941
*Outline of standard Kahn test with appendix of special Kahn procedures	R. L. Kahn, *V.D. Inform.* (Supp. 11)		29	1940
Comparative specificity of W.R. and K.T. in syphilis and yaws	*Acta med. philippina*	1	137	1939
*K.T. effects of temp. ..	*Amer. J. Syph.*	25	4 articles: 151, 157, 162, 173	1941
Verification test in latent syphilis	*Arch. Derm. Syph.*, Chicago	41	817	1940

* These items will give full details of technique.

LETTERS, NOTES, ETC.

Civilian Jobs for Medical "Other Ranks"

Lieut.-Col. J. G. FOSTER writes from 85, Eccleston Square, London, S.W.1: In reply to the letter of Dr. J. McD. Glennie (June 9, p. 824), may I bring to notice the Royal Army Medical Corps Association? This organization up to the outbreak of war did invaluable service in finding work for other ranks of the R.A.M.C. on discharge, and we hope now that the war is over and men become available to resume our activities. Every man on discharge is handed a slip with our address. On this he shows his qualifications and the kind of work he desires.

Dr. P. H. KENDALL (Stoke-on-Trent) writes: I would like to ask the following question. The letter on civilian jobs for medical "other ranks" includes the question: "Can we offer them reasonable employment at reasonable wages?" What help might one expect from a first-class nursing orderly for dressings, massage, injections, dispensing, assistance at minor operations, and medical clerical work, and what reasonable wage should one offer?

Correction

In the account of the discussion at the Royal Society of Medicine on the physiology and treatment of starvation, in the *Journal* of June 9 (p. 818), Dr. P. Cuthbertson was wrongly reported at the end of the third paragraph under the heading, "Preparation of Hydrolysates": "... providing 50 grammes of hydrolysate and 50 grammes of glucose" should have read "... 50 grammes of hydrolysate and 150 grammes of glucose per day."